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[OFFICIAL NOTICE.]

Ohio Gas Light Association.

OFFICE OF THE SECRETARY, COLUMBUS, O., Feb. 20, 1894.

The Tenth Annual Meeting of the Ohio Gas Light Association will be held in this city March 21st and 22d, 1894. The following papers are promised:

"Welsbach Burners with Artificial Gas," by J. W. R. Cline, Springfield, Ohio.

"Gas for Fuel," by Donald McDonald, Louisville, Ky.

"Testing Meters," by W. H. Anson, Columbus, Ohio.

"Joint Business of Gas and Electricity," by Dr. Howard Jones, Circleville, Ohio.

"Gas Companies and the Public," by W. C. Boyle, Salem, Ohio.

"Uses of Tar Pitch and its Future Market," by R. Watt, Chicago, Ills.

"Leaks," by W. W. Prichard, Portsmouth, Ohio.

We have conditional promises of other interesting papers.

It is desirable that there should be a general discussion on matters of interest.

The session will be held in the Employees' Hall of the Columbus Gas Company, and the Neil House will be hotel headquarters. Accommodations can also be had at the Park Hotel, Grand Central Hotel or Smith's European Hotel. Members are advised to secure rooms in advance. You are cordially urged to attend the meeting.

A. P. LATHROP, Secretary.

[OFFICIAL NOTICE.]

Pacific Coast Gas Association, Second Annual Meeting.

OFFICE OF THE SECRETARY, OAKLAND, CAL., March 5, 1894.

Upon the suggestion of Mr. Jos. B. Crockett, our President, and with the concurrence of the Directory, it has been decided to hold the next meeting of this Association at Sacramento, on Tuesday and Wednesday, the 15th and 16th of May, 1894.

This has been done to afford an opportunity to members to combine the business of our annual conclave with the pleasure of a visit to the Midwinter Fair, as the time appointed by the by-laws would be after the Fair had closed, and many if not all of the members who live at a distance from San Francisco will thereby be saved the necessity of making two trips to the bay.

Our first meeting was a complete success—the second will not be behind it in interest. Already papers are promised upon topics of interest to gas men, among them being "Practical Analysis of Gas," illustrated with complete apparatus, "Proper Books of Record for Gas Companies," and "Prepayment Meters."

Each member's presence is necessary to the preservation of an organization whose ultimate object is the bringing together in unity of thought and action the gas fraternity. Come prepared to ask questions, to give and receive information. The good accomplished by the last meeting has been felt throughout the year in better results of manufacture and distribution. The pertinent question personally asked and answered is productive of more results than volumes of print.

In order that arrangements may be made for your care and comfort while at Sacramento, please advise me on receipt of this if you intend to be present. You will be later advised concerning headquarters, place of meeting, hotel accommodations, etc.

We want at this meeting a perfect circulation of members, and no dead ends. Yours very truly, JOHN A. BRITTON, Secretary.

BRIEFLY TOLD.

THE MEETING OF THE OHIO ASSOCIATION.—The Ohio Gas Light Association will round out the first decade of its life, at Columbus, Ohio, this week, and from the programme already distributed by Secretary Lathrop one can readily decide that the tenth annual meeting will be well worth attending. The seven members who promised to prepare papers have redeemed their promises, which insures ample matter to evoke lively and profitable discussion. The subjects are well chosen, and are on themes each distinct in itself. In fact, for a list covering so many separate numbers, it is rare that such great diversity is found; and this is extremely satisfactory, since it shows that, despite the many meetings which have been held by the gas makers of the States, if one is so minded, he can without exceeding difficulty still find a topic of interest on which to hang a paper. We confess to a feeling of curiosity as to which side of the question of the "Joint Business of Gas and Electric Light," Dr. Jones, of the Circleville Company, will place himself. The Doctor, who is President of the Company, is a level-headed business man, not prone to rendering ecstatical judgments; and as the Circleville Company has tried the game of supplying both gas and electricity, the Doctor cannot be other than qualified to speak by the book. Other papers, which look especially promising to us are those by Mr. Donald McDonald, of Louisville, Ky., and by Mr. R. Watt, of Chicago. The theme chosen by the latter—"Coal Tar Pitch: Its Uses and Future Market"—is especially acceptable, in that the Association will no doubt have a report from its Tar Committee, a preliminary return from which was published in the JOURNAL for January 29th of this year. President Rutterworth will no doubt introduce the technical proceedings with an address which will be quite up to his thoughtfulness and ability. The queries so far committed to the custody of the Question Box number 15, and in themselves would be sufficient to insure an interesting meeting. The meeting room is to be the well arranged Employees' Hall of the gas works, and the Neil House cannot fail of being an acceptable head quarters.

CHANGE OF DATE IN THE TIME FOR THE SECOND ANNUAL CONVENTION OF THE PACIFIC COAST ASSOCIATION.—From Secretary Britton's official announcement respecting the second annual meeting of the Pacific Coast Association, it will be seen that the date for holding the same has been brought forward, from July 17 and 18, to May 15 and 16. The impelling cause for the change certainly would seem to justify it, in that under the change the members can have the opportunity of attending the convention and inspecting the "Midwinter Fair," which spectacle is a credit to the resources of the great State which it typifies. The only drawback to the alteration of dates is that the Coast meeting will clash with that of the Western Association, which will assemble this year at Cleveland on May 16 and 17. However, there is no help for it; and in any event the clash will not be a permanent one. The Coast Association even now has the promise of three papers—a most satisfactory nucleus—and it is more than probable that other contributors will announce themselves ere the roll call will be heard in Sacramento.

THE STATE OF TRADE.—From the best figures of returns available in regard to sendout during the month of February, we think it is safe to draw the conclusion that matters are mending. In any event, the average goes to show that the loss experienced in gas sales during February, 1894, as compared with February, 1893, was a trifle over 4½ per cent. No doubt, this is not very warm comfort, but it must be accepted as reassuring, when it is borne in mind that the average loss for December was close to 10 per cent., and that the loss for January was virtually equal to the loss for December. The statements show on their faces some surprising variations—companies not 100 miles apart reporting in the one instance a notable gain (in one case as high as 10 per cent.), and in the other a loss of 7 per cent. Local causes, however, explain the seeming irreconcilable discrepancies. Taken as a whole, the returns indicate beyond a doubt that the state of trade is vastly improved.

NOTES.—Mr. R. F. Fitz, whose work in the management of the American Gas Company's property at Elgin, Ills., was greatly appreciated by his employers, has been obliged to resign, his resignation taking effect on April 1st. Continued ill-health is the sole cause for his action.——A water gas plant of the Sutherland type is to be installed at the works of the Lexington (Mo.) Gas Light Company, which Company has changed hands within the past month. It is now capitalized in $50,000.——Mr. James R. Smedberg, who is temporarily employed by the P. H. & F. M. Roots Company, Connersville, Ind., is open for a permanent engagement. All communications should be forwarded to Connersville.

[A Paper read before the Society of Gas Lighting.]

Coal.

By DR. A. W. WILKINSON.

The mere mention of coal is sufficient to attract the attention of gas engineers, who are always on the alert for better or cheaper coal, or for some improved way of its use. Its history, which is so well known, is always interesting; and, like all good stories, bears telling over and over again. It carries us back to the time in the world's history when everything was so different from what we see now. By some it is thought that the world was surrounded by its own photosphere or shell of light and heat, as the sun is now; they think this must have been so, because we find, at the extreme north, coal (Dr. Kane brought very good samples of coal from beyond the Arctic circle), as well as in the temperate and torrid regions.

Coal is derived, without a doubt, from vegetation, but not such as we see upon the earth to day, or if there still be some few varieties, they are stunted and give but little idea of the gigantic growth they attained in remote periods. Plants that we now see growing 2 or 3 feet in height, then grew to 100 to 200 feet and 40 to 50 feet in diameter. Mosses that form but a light carpet now grew to several feet in thickness, covering the earth with a mat of vegetation so thick and compact that no animal could penetrate it. To have produced this immense growth there must have been great heat and moisture and possibly a continuous light, and an atmosphere highly charged with carbonic acid gas, which is the food for plants. Under the stimulus of the sunlight, plants decompose carbonic acid, appropriating the carbon and liberating the oxygen. It would seem as though the plants were designed for the express purpose of purifying the air or fitting it for the use of man and the higher animals. Many theories have been advanced to account for this extraordinary growth of plants. Tyndall, from experiments on the atmosphere charged with carbonic acid, came to the conclusion that sufficient heat could be retained, or prevented from radiating into space, to have given the plants the required heat for the extraordinary growth.

If we look at the map of our country at the carbonaceous period we will see but a small part of the present land out of water, the granite hills of Vermont and New Hampshire and the backbone of the country, the Rocky Mountains, with a few peaks of the Allegheny hills, are all; between them, shallow bays, where the drift of plant life found a lodging, became water-soaked, sank to the bottom, in turn to be covered with earth. Gradually the temperature of the earth underwent a change; ice accumulated at the poles and extended towards the equator; winter took the place of constant summer; glaciers formed thousands of feet in thickness and forced onward down the incline, ground the rocks to powder, covering the deposits of vegetation many feet in thickness. Gradually the temperature of the earth changed; the ice disappears, and summer for a portion of the year returns. Internal heat of the earth causes the plants to undergo decomposition. At first there is a giving up of hydrogen combined with a little carbon; later the oxygen in combination with carbon is liberated in the shape of carbonic acid, if the heat be continued the oily compounds (petroleum) are set free. If the earth above be loose and porous these escape into the air; if fine and compact they are retained. Thus we have our natural gas seeking the higher portions of the underground hills, the oils seeking the underground valleys. If the heat be long continued it results in the production of hard coal. The great varieties of coal that we have are due to the different vegetation of which it is composed, and to the different influences it has been subjected to.

If we distil soft coal under great pressure, we will produce, not porous coke, but hard, compact carbon, not unlike anthracite coal. Although coal must have been known from the earliest times, we find but little mention of it until about 500 years ago. Egypt, Greece and Rome had no call for coal; the climate was warm the most of the year, and what little use there was for fuel for cooking wood and oil supplied. The half-savage life of the European countries of our era had plenty of wood for their wants. This country was likewise well supplied; in fact, it required hard work to clear the land of its immense growth of trees, so that sufficient land could be had for crops Even to-day the destruction of trees is carried on for like purpose, the wood burned upon the ground to get rid of it In the 15th century we find that sea coal was brought to London and sold for fuel greatly to the injury of the wood market, and laws were passed prohibiting its use. It was claimed that it was unhealthy, causing fevers, consumption and various diseases, and people were cautioned about its use But cold winters and scarcity of wood soon drove people to its use. The difficulty of mining coal prevented its extensive use, and not until the discovery of the steam engine can we date its introduction It would seem that the Almighty

had reserved the immense stores of coal for the later and higher civilization; in fact, civilization seems to be the use of coal. England, without coal, could not support a tenth of her population. The same can be said of almost any country of Europe. Without coal steamships could not cross the oceans, railroad trains could not cross the continents, factories could not be operated, we would be without light and heat for our cities; in fact, most of our cities would be uninhabitable.

This leads us to another and a very serious question. Coal must, in the nature of things, become exhausted some day. England can count the days her coal fields will last, at the present rate of consumption, to say nothing of increase. The same may be said of the other countries of Europe. Our own country is so abundantly supplied that she can supply coal long after their's is exhausted; but the end will come some day, and not so far away but that we can count the years? What next? Shall we discover some other motive power, or will civilization cease in the temperate region of the earth? Will man be driven to the torrid zone? for it certainly would be impossible to support the present, to say nothing of the increased population that must come. In coal we have the ancient sunlight and heat stored for our comfort, necessity and civilization. Without it man becomes but little above the savage.

[Official Report—Revised by the Secretary—Continued from page 374.]

TWENTY-FOURTH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held at Young's Hotel, Boston, Mass., Feb. 21 and 22, 1894.

Second Day—Morning Session.

The Secretary read the following telegram:

"Grand Rapids, Mich., Feb. 21, 1894.

"To the New England Association of Gas Engineers:

"Hearty thanks for your congratulations. We will try and honor our parentage.

"By order of the Michigan Gas Association.

"Henry Hyde, Secretary."

Memorial Committees.

The President appointed Messrs. G. B. Neal, Jas. F. Rogers and H. A. Allyn a committee to draft resolutions in connection with the death of Mr. Jones. Also, Messrs. W. R. Addicks, C. F. Prichard and C. S. Waldo, to prepare a minute in connection with the death of Mr. Tufts. The committees were instructed to bring in their resolutions if possible in time for publication in the Journal's report of the proceedings.

The President—We have this morning two papers, one of which—that by Mr. R. B. Taber—is not on the printed list. We will first take up the one by Mr. N. W. Gifford, of New Bedford, Mass., on

LIME BOXES FOR REMOVING CO_2.

The purifying plant of which I am about to speak consists of four boxes, 8 ft. × 13 ft. × 3 ft. deep, arranged in the usual manner in the four corners of the room, with dry center seal. Home made sponge, containing from 30 to 40 lbs. of iron chips to a bushel of sawdust, is used in these boxes. The only oxidating agent used in the preparation of this material was ammonia liquor from the tar well. Each box is filled with 110 bushels of oxide, which gives a bed about 2 feet in thickness. The sponge is revivified by means of the Learned-Wood system of drawing air down through the box.

The annual make has reached something over 45 millions, with a quite satisfactory rate of increase until the present hard times came on; but with a good outlet for gas in sewer trenches, etc., the purifiers have had their usual amount of work to do. It has frequently been found necessary to change several boxes in one day, and naturally there might be times when some sulphur would slip through and go into the holders. Thus this part of the plant had become a menace to the effectual running of the works.

Larger boxes would have required more space than was available and mere expense than was allowable. So, as a compromise between what was wanted and what could be had, two additional boxes of same size as the old ones were put in, between the old purifiers and the meter. These are worked by independent valves, the stems of which are brought up flush with the floor of the purifying room between the boxes, and are turned by a wrench. Thus the foreman can operate his valves standing beside the box, and still the floor is free for the use of barrows, etc. These boxes have been filled with lime and changed on the appearance of CO_2 in the gas at the outlet.

The gas is a mixture of coal and water gas, containing, for the month of January, 40 per cent. of the latter. The water gas is drawn continuously from the relief holder and the two gases are mixed at the exhauster.

The lime was made from oyster shells, and, from its appearance in the store room, seemed to be of fairly good quality. The following analysis shows rather more carbonate than might have been wished:

Moisture	29.36	per cent.
CO_2	4.73	"
Combined lime	6.70	"
Insoluble residue	1.82	"
Available lime	57.39	"
	100.00	

An analysis of a sample from a foul box, which seemed to have done its work fairly well, resulted as follows:

Moisture	21.20	per cent.
CO_2	26.18	"
Combined lime	33.32	"
Insoluble residue	2.22	"
Available lime	17.08	"
	100.00	

For the month of January the rate of flow per bushel of lime was 8,530 cubic feet. The gas before the lime boxes contained an average of 2 per cent CO_2, and .5 per cent. after passing through the lime. Hence there was 15 cubic feet of CO_2 removed from each thousand feet of gas passed, and 128 cubic feet of CO_2 removed by each bushel of lime. This would weigh, under normal conditions, 15.74 lbs.

The lime, as put into the boxes, weighed 55 lbs. per bushel, and this, according to the above analysis, would give 31.57 lbs. of available lime per bushel, which is able to unite chemically with 18.77 lbs. CO_2, or 152 cubic feet. This shows a lost efficiency of 3.07 lbs., or 24 cubic feet of CO_2 per bushel of lime, equal to 16.36 per cent.

It may seem strange that so large an amount of free lime should remain after being in contact for so long a time with an excess of CO_2. In fact, one sample taken from an upper tray of a foul box contained less than 6 per cent. of CO_2. It may have been that the lime was not sufficiently pulverized, thus allowing a great many small lumps to become coated with an impervious layer of carbonate and yet contain free lime on the inside. This would seem to emphasize the necessity of careful preparation of the lime before placing on the trays.

I must confess that previous to this use of lime I had somewhat vague ideas as to how much CO_2 a bushel of lime ought to absorb, and it is quite possible that a little calculation like the following would destroy our faith in some of the marvellous results of lime purification, which we sometimes hear related.

For instance, if this lime had contained no carbonate it would have had 37.85 lbs. available lime per bushel, which should have absorbed 182.9 cubic feet of CO_2, and this being 1.5 per cent. of the gas acted on would give a limit of 12.190 cubic feet per bushel, beyond which it would be impossible to go.

From the degree of heat required to decompose the limestone or shells in burning lime one might naturally suppose that carbonate of lime is a tolerably solid compound. Undoubtedly it is so in most cases, but I am led to believe that there are combinations of calcium and CO_2 which are not so stable. On one occasion the gas passed, first, through a fresh box of lime, and then through one which had been in use. The gas at outlet of second box showed a little more CO_2 than was passing the sponge boxes. The first thought was that the fresh lime was, from some reason, not doing any work. But a test of the gas as it issued from this box showed it to be free from the sparkling carbon compound. The foul box was turned off and the conditions became normal once more. This seemed to prove that the gas, once freed from CO_2 by the first box, picked up as much more on its passage through lime already charged with CO_2.

A similar effect has been noticed when, by disarrangement of the oxide boxes by back pressure, etc., sulphur has passed into the lime boxes—*i. e.*, more CO_2 would show at outlet, probably having been set free by the sulphur compounds.

That the presence of CO_2 in an illuminating gas has a tendency to depress the candle power is, I think, a generally recognized fact, and this loss of light is greater when the gas is burned in a flat flame burner than when an argand is used. But the combined causes which affect the candle power of a gas as it goes to the consumer are so complex that it is extremely difficult to say with certainty, in any given case, just which cause has done the mischief, especially so when the variations are slight.

Moreover, I believe it has been demonstrated that if the CO_2 be removed by lime, enough illuminants will be destroyed by the lime to more than compensate for the advantage gained by absence of the CO_2.

In order to eliminate all causes, other than the action of the lime, which might affect the candle power, these tests were made in the following manner:

The photometer room is arranged with an 100-inch bar, with scale marked on either end. There are two meters and governors, so that gas or candles can be used at either end. Connections were made before and after lime boxes, and the gas brought to an ordinary bulb burner, fitted with 6-feet lava tip, at each end of the bar. Thus, on one side was a burner supplied with 5 feet per hour of gas before passing through lime, and at the other end of the photometer bar was a similar burner supplied with the same amount of the same gas after having passed through lime. To avoid any difference of light due to the burners themselves, the meter connections were so arranged that the gas could be changed from one burner to the other, and the mean of a test from each side taken as the true difference of light.

Had the two lights been equal the disc when balanced would, of course, have stood in the center of the bar, and any variation would be indicated by the readings in fractions of the lights measured rather than in actual candle power. This arrangement gave the percentage of variation directly, without the delay and probable error from measuring each light against a candle and then calculating the results.

In one case a mixture of 8 per cent. of water gas and 92 per cent. of coal gas, of about 17-candle power, showed on analysis 2 per cent. of CO_2 before and none after passing lime. The difference in light in this case was 18.55 per cent.

Another mixture of 46 per cent. water gas and 54 per cent. coal gas showed 2 per cent. before and .3 per cent. after passing lime, and gave a candle power of 21.37 per cent. This gave a difference in light of 12.57 per cent., which, calculated by direct proportion to a basis of 2 per cent. instead of 1.7 per cent. of CO_2, would have given a difference in light of 14.7 per cent. These per cent. losses are practically the same in actual candle power, *i. e.*, about 3.1 candles in each case.

These results correspond quite closely with those published by the Gas Inspector some years ago, although in this case the loss per unit of CO_2 is something more than found by the Inspector. This may have been occasioned by the use of a lower grade of burner, he having used a "Bray" burner, and in the case noted above the ordinary lava tip was used.

These figures may seem startling, but I believe them to be substantially correct. Naturally the loss would have appeared less if argand burners had been used. The report before quoted gives the loss due to CO_2, when an argand is used, as one-third of that when the gas is burned in a flat flame. Yet the flat flame is in almost universal use, and by it the public judges our product.

The question now comes as to whether it is cheaper to remove the CO_2, and thereby secure the increased candle power, or to add more enricher and allow the non illuminant to remain in the gas.

Assuming 2 per cent. of CO_2 (which I believe is a low average for a mixed gas) to cause a loss of 3 candles, how much oil or naphtha will be required to offset this loss?

Taking the value of naphtha as 6.5 candles per gallon, .46 gallon would be required to raise the illuminating power of 1,000 feet 3 candles, which, at 4 cents per gallon, would cost 1.84 cents for the additional enricher.

The cost for lime in the case above mentioned was about .7 cent per 1,000 feet, and if extra labor had been required the total cost would not have been far from 1 cent per 1,000. This would still leave a balance in favor of the use of lime.

These items will naturally vary in each case, according to the cost of lime and enrichers, and whether there may be any surplus help in the purifying department which can be used to handle the lime.

There is another advantage in the absence of CO_2 other than the gain in actual candle power as shown by the photometer, and this is the decreased area of blue in the flame. Of two flames of equal lighting effect, the one having the less expanse of non-illuminating surface will commend itself to the ordinary observer, or, as some one puts it, "I don't like the big hole in the flame."

In the two flames tested the difference in this respect was quite apparent. I had hoped to be able to show photographs of the flames illustrating this difference, but am unable to do so.

CO_2 is objectionable also on account of its weight. It being one of the heaviest gases, its presence materially increases the specific gravity with its attendant disadvantages.

In our case the object of putting in auxiliary lime purifiers was primarily to guard against occasions when the old boxes filled with oxide might fail to take care of the sulphur. In many cases the lime when taken from the boxes showed no signs of sulphur, but occasionally there would be some discolorations, indicating the absorption of sulphur by the lime. The sulphur tests for the month of January have averaged about 10 per cent. less than those for the corresponding period last year, the conditions of coal and amount of gas made being about the same in each case, with the exception that this year the mixture contained 8 per cent. more coal gas than last, which would give a little more sulphur to be taken care of by the purifiers.

In conclusion, I will express my opinion, based on the above, to be that it does pay to use lime boxes in connection with those filled with oxide of iron.

This may depend somewhat upon what the object of our undertaking may be. If it is to put the greatest possible number of cubic feet of gas into the holder for the lowest possible number of cents per 1,000, which, measured under the most favorable conditions, will meet the legal requirements, then in such a case there may be room for doubt. But I conceive the object which the members of this Association are seeking, and which has been repeatedly stated in these meetings, to be something broader and higher than this; and I will venture to say that, in my opinion, if the financial and engineering departments of the lighting companies of Massachusetts were now, and had always been, united and sincere in their efforts to give their customers the best possible service consistent with a reasonable return for the capital invested, that the public spirited gentlemen who are so anxious to legislate for the welfare of the dear public, who are obliged to use artificial light, would find it more profitable to turn their eloquence to the aid of some other cause of social reform.

Discussion.

The President—We have heard a very interesting and able paper on this subject. I know that some of you have tried similar experiments in your own works, and hope we may have a full and free discussion. I am sure Mr. Humphreys has had some experience in this line.

Mr. Humphreys—I did make some experiments in this line some years ago, but do not recall the figures. I thought I had them in my notebook but find that I have not. I did not find quite as much difference in candle power as Mr. Gifford has stated. My recollection is to the effect that testing the gas before and after removing the carbonic acid made a difference of .7 of a candle on the argand, and approximately a difference of one candle on the flat flame burner. At that time I was using cannel coal to enrich, and I figured that it was cheaper to use lime than to put that candle back into the gas. More recently, in using a combination of coal and water gas, I am able to enrich more cheaply, and I have not paid so much attention to the use of lime. I have not decided not to use it, but have been perhaps a little slow in one point; that is, my feeling is, in using lime simply for the removal of the carbonic acid, we ought to be able to recover the lime quite easily; and I have put off taking the matter up seriously until I could go into that aspect of the case. Using new lime every time adds considerably to our expense account, as lime is rather expensive with us in Lawrence, so that now I am not using the lime in a very systematic way. I have also found one or two difficulties in the arrangement of the boxes. I do not know whether my arrangement is the same as that of Mr. Gifford, but I have two center seals and four oxide purifiers on the first, and a center seal and two lime purifiers on the second. That is, I use the lime after the oxide, and am compelled to use it in that way. I think that is wrong. If I could have 6 purifiers arranged on the valve system so that I could use them in any way I wished I would probably use more lime than I do. I encountered one or two difficulties on account of using lime after the oxide. I have found that sometimes the sulphureted hydrogen will get over into the lime boxes; and I will find traces of sulphur—it being expelled by the carbonic acid with the incoming gas. To sum up my present condition in the matter I may say I am rather on the fence, but my present feeling is that rather than use lime as I have been using it (buying fresh lime and using it in two boxes after the iron), I would put the candle power back in the shape of oil. I have not decided the question for all time, but am considering the matter of recovering that lime on the one hand, and also the matter of rearranging the purifying boxes.

Mr. Allyn—I would like to ask if Mr. Humphreys considers he derives any permanent benefit by incorporating lime with the oxide as is done by a good many manufacturers of the oxide. I confess, as far as I am personally concerned, I do not really think we did derive any benefit. During the first few changes we undoubtedly derived some benefit from the lime in the oxide, but after that it seemed to me we were not deriving any benefit from it; that we were carrying just so much additional

material without deriving any benefit. In talking with a gentleman here who represents a manufacturer of oxide he differed with me; and as he was a practical chemist, and I do not profess to be, I thought I would like to have more information on the subject.

Mr. Humphreys—I must admit I cannot see any particular benefit in using lime after it has become thoroughly used up.

The President—In this connection I desire to state that Mr. F. C. Sherman (whose absence we all regret, and who has not missed a meeting of our Association for a long time, possibly never before) has written a letter stating that his son, Mr. C. D. Sherman, has made a series of experiments in this connection. Will Mr. Sherman give us his results?

Mr. C. D. Sherman—Last summer we put in four new purifiers 20 x 24, inside measurement. Those were fitted up ready for use about the middle of January, and were filled with oxide, our old ones being filled with lime. At the present time, if we wish to do so, we can turn our gas and pass it either through the old set with lime, or through the new set filled with oxide. In the early part of this month I made a series of experiments to ascertain if possible the effect on the candle power when gas was passed through oxide and when passed through lime. I have brought the figures with me, and I will read them, as they may prove interesting to the members. I commenced on Monday, Feb. 5. I might say we tried in these experiments to pass the gas through the purifier under the same conditions; that is, we set our water gas meter to draw the same proportion of water gas per hour. This water gas we mixed at the exhausters. On Monday morning I made a test of the candle power of gas at the works, or before it goes to the holders. I used an argand burner. At that time the gas was passing through the oxide purifiers. I made two tests. The result was 20 and 20.2, or an average of 20.1. At half past one, the afternoon of Monday, we turned the gas through the lime purifiers; and late that afternoon, about 4 o'clock, I made three tests for candle power. The result was 20.8, 20.6, 20.4—or on average of 20.6; so that in three hours the difference was half a candle in favor of lime. On the next morning, Tuesday, I made three more tests, the average of which was 22.2. On Wednesday morning, the gas still going through the lime purifiers, three tests gave me an average of 21.2. Then, at noon on Wednesday, we turned the gas back on the oxide, and that afternoon, about 4 o'clock, I made three tests for candle power, and found the average was 20. On Thursday morning I made three more tests (at this time the gas was going through the oxide purifiers), and the result was an average of 19.8. In summing this up, as I said, I found on Monday afternoon a difference of half a candle power in favor of lime. The two tests for lime, for Tuesday and Wednesday mornings, 22.2 and 21.2, gave an average for the lime of 21.7. Adding the two results for Wednesday and Thursday on the oxide gives me an average of 19.9, or 1.8 candle power difference in favor of using lime. I find it takes about half a gallon more of naphtha in our water gas plant if we want to keep up the candle power than it would be if we use lime.

The President—I think Mr. Hinman can also give us some information on this subject.

Mr. Hinman—I made some experiments a few years ago, by taking gas and adding carbonic acid directly to it, and taking the candle power both before and after the addition. I have not the figures with me, but my recollection is they are somewhere between the results given by Mr. Gifford and those of Mr. Humphreys. I think the difference in results can readily be explained by the difference in burners used. I did not experiment very much in that direction, but as far as I went the experiment led me to the conclusion that the burner used made a very great difference in the loss of light from carbonic acid, and that with an argand burner the loss was comparatively insignificant. As the Massachusetts State Inspector is obliged to use the burner best adapted to the gas, the carbonic acid does not make much of a showing in the official reports; that is, the companies that leave carbonic acid in their gas show better than they should. With a flat flame burner the results were very marked. But there is a good deal of difference in flat flames. If you have an excess of pressure, approaching to blowing, the deterioration is very perceptible. If you reduce the pressure down just so the burner will not smoke, you do not get so much of a deterioration. I have forgotten just what my results were, but I think that something like one per cent. of carbonic acid in ordinary coal gas would make a reduction of about one candle power. I also found that with richer gases it did not make so much difference. That is, absolutely. In percentage it did not make nearly the difference. But if one per cent. of carbonic acid in common coal gas gave a deterioration of about one candle, with 25 or 30 candle water gas, or any rich gas, it would not be near as much. It would not go over one half or two thirds of a candle for each per cent. of carbonic acid. Reckoned in percentages the loss would be only about one-third as much for 30 candle gas as for 17-candle gas.

Mr. McKay—In the tests which Mr. Hinman made with the flat flame burner, was the flame parallel to the bar of the photometer, or perpendicular to it?

Mr. Hinman—It is always my custom to use the flame inclined at an angle of 45°; but as far as my experiments went I could not find any very material difference between the flat side and the 45° degrees of inclination. Theoretically there is a difference, and with very careful experiments you could detect it; but for practical purposes I doubt if you could see any particular difference. There is a very marked difference between the results obtained from the edge of a flame and from the flat side, but at an angle of 45° there is not, so far as my experiments indicated, any difference worth talking about.

Mr. Neal—Can Mr. Sherman give us the difference in cost between the two methods he pursued—without the lime, when half a gallon of oil more was used, and with the lime? Of course the lime cost more than the oxide.

Mr. Sherman—I thought of looking that up once, but did not do so. I cannot say what the difference would be. At the present time we are using half a gallon of oil more to keep up our candle power.

The President—May I ask Mr. Gifford a question? I notice he assumes 6½ candles as the value of naphtha per gallon per 1,000 feet. Is this his average result?

Mr. Gifford—I took my best results. I have averaged that for some months, but not for many. I thought to be on the safe side and put it as high as that, so as to make the cost as low as might be. I am satisfied it can be done, but I did not do it all the time.

Mr. Stiness—I move the thanks of the Association to Mr. Gifford for his paper. (Carried.)

The President—The next paper is by Mr. Robert B. Taber, on

THE GAS INDUSTRY IN 1886 AND 1892.

Mr. Taber—I owe a word of apology for volunteering a paper, but I was asked specially to do what I could. I was unable to complete it in time to have it printed in the list, but at the same time the subject was quite an interesting one to me, and I hope that it will prove the same to you.

Mr. Taber then read as follows:

I ask myself sometimes the question, "What changes are necessary in the management of the gas industry to day, analogous to the changes experienced in other departments of the manufacturing and commercial business of the country?" and try to shape an answer based on the altered conditions now existing through the development of the oil and electric industries, and the changed attitude of the various corporations to the municipal interests of the State.

Such an answer must necessarily be compiled from statistics, and, so far as Massachusetts is concerned, depends largely on the published reports of the Gas Commissioners; and it may be profitable for a few moments to consider and compare these reports for any two years sufficiently far apart as, say, 1886 and 1892, and perhaps to examine with these figures some of the "environments" of the present situation.

I have chosen the two years above mentioned because I find, in the report of 1887, for the year previous the first mention of the development of the electric business in the State, and it may surprise some to remember that at that period there are reported 40 electric companies with an aggregate capital of about 3½ millions of dollars, and having a capacity of about 5,500 arcs and 30,000 incandescent lamps. From this, at the end of six years, had grown a business with a capital investment of 12 millions and a capacity of 18,500 arc lights and 217,000 incandescents.

Of the development of the oil interests I am unable to speak as definitely. How many millions there may have been invested in better commercial facilities through the distributing depots at all the large cities, and what factor the increased efficiency of high power lamps like the Rochester, etc., the decreased price of materials, oil and naphtha—of these essential features in the growth of the oil industry I have no figures. It is possible, however, from these reports to ascertain the figures of the gas industry and their status in these years.

The total gain in gas consumption in this interval to public and private consumers is 42 per cent., or 7 per cent. per year, and there was added, either from necessity of better apparatus or increased growth, or both, an additional investment of about $10,700,000, including over 300 miles of street mains and about 25,000 meters; the increase in investment being almost equivalent to the gain in sales. This increase would seem to indicate and emphasize the celerity with which the gas companies hastened to equip themselves for the better work they were called upon to do, for

a reduction of price was made, amounting on the sales of 1892 to $1,150,000, and the average price was reduced from $2.17 to $1.83, or 34c. per 1,000 cubic feet; and it is fair to suppose that the report of last year, not yet published, will increase this figure to over $1,500,000 saved to the gas consumers in 1893.

The net profit of 1886 is not reported; that of 1892 is 8.9 per. cent. on the capital invested, and this includes no depreciation account—a moderate profit for an investment of this nature.

So far, then, the figures of the report go, and it seems to me there are causes which qualify our success in these 6 years, since 7 per cent. and 8.9 per cent. are certainly not glowing colors in which to paint an industry like ours, and surely do not bear out the jealousy with which it is regarded by the public; and while it would be a curious study to define just what part to day our illuminant bears in the total illumination of any city or the entire State, the total candle feet, or the total number of installations, or the relative number of new installations of gas, electricity or any of the oil methods, as air gas or parlor lamps, I want to call your attention to some of the phases of that illumination which may perhaps receive at your hands that attention and remedy which always follow well directed efforts, and to which I might give a name, as the problem of the sale of gas per consumer or per mile of street mains; and I will try to illustrate them by giving them a local habitation in Boston, not with any idea that they are confined to this city, or even more especially prominent here, for they are not; and, indeed, in this I shall hope to be pardoned by the management in this city, which I most heartily respect.

Those who are resident here may understand my meaning in locating my thought, first, in old, historic North street and almost beneath the famous belfry of the old North Church. The city civilization has long since grown beyond this section, and the stately old homes have degenerated to stores and again to shops, now reeking with onions and "old clo's." Of course the street main is idle, and it is probable the section will consume 10,000 gallons of petroleum per week. I say "of course," because North street elucidates to me the fact that the business method, the 1,000-foot, wholesale unit of the gas industry is too large a unit for the pawnbrokers' shops, even with gas burners which, at $1 per 1,000, cost ½ cent per hour, or that the gas company's methods of sale, and these exist all through the State, are at fault, and the temporary creditless, but probably profitable trade, goes elsewhere. Perhaps it might be retained by the penny-in-the-slot meter, perhaps free or partly free installations of burners and piping, analogous to the electric system, might be devised; but this North street, with its original investment of mains and services, is now unproductive, and the profits are *nil*, or nearly so, though the investment remains active. And there are cities in the Commonwealth whose population has increased 50 per cent. in the past few years, and yet the number of miles of main, of meters and services, has been almost or entirely stationary; and of these miles of mains there are large sections which, like North street, require some new Columbus, if a gold mine is to be discovered to the gas company. And, lest I should be criticized, since all mains cannot be productive, and coming further up into the heart of the city, to Washington street, we find here one store front after another, the lobbies of the principal hotels, the entire space of the theaters, all lit with incandescent or arc lights; and perhaps your attention is called to the grouping or the color, some special effect apparently involuntarily drawing the eye. Now, it can be easily conceded that the total illumination of a shop lit with Boston gas, of 25 or more candles, is more effective than incandescent lamps or arc lights, and with the low rate of gas there is no oil or naphtha (the North street feature), but the same result follows in a decreased sale of gas. Even Lungren lamps (so fatal to many of our hopes and pocket books), and Welsbach burners also, are not seen; and, in spite of a higher cost, the annoyance of insurance regulations, or the cost of new installations, as a practical fact most, or certainly the majority, of the retail shops, and all places supposed to be specially *a la mode* and fit for the upper 400, are lit with electricity; in other words, the competitor has the field. To meet this, 29 of the gas companies of the State, as reported in 1893, have established electric plants of their own, and a profit of 6.8 per cent. on the capital invested is reported; but unless the use of electricity has increased sympathetically the consumption of gas in the second and upper stories of the buildings on Washington street, the investment of the street main is, of course, rendered less productive, since the novel development of gas stoves is not found on this street.

I wish there were some public records to determine just this point, for it is a most interesting one, what effect the introduction of incandescent and arc lamps has sympathetically on the sale of gas in any district.

From such data as I was able to obtain last year I was led to infer that there had been a loss in percentage of gain in the five years succeeding than in the five years preceding the introduction of electricity, but the inaccuracy of any comparison of such statistics, gathered locally and applied indifferently, is easily seen, and anyone can best judge for himself in his own locality this effect. But, certainly in the new and more modern shops, whether because it is the fashion or for some other reason, this displacement of gas has gone on until many a manager is puzzled to define the cause and relieve it. And since I do not think it a "matter of money," I am inclined to think it a matter of the modern demand or method of best advertisements of the merchant's needs; and, looked at from this point of view, and appreciating the needs of the retail dealer, it is not the question of burners alone, to which the attention of this Convention was called a few years ago, but of piping also—an intelligent application of luminosity to display, or such arrangement of lighting effects as shall be best to follow the shopkeeper's ideas, and sell the goods. It is the fine art of "setting the piece," as the artist would tell us, which is lost to the gas company, because the gasfitter has only parallel lines of rigid pipe, and perhaps some antique monstrosities in the shape of chandeliers, to compete with the flexible cords and special effects of dazzling lamps. This thought was so splendidly illustrated in the shops of the Palais Royal, where behind the transparent glass, so polished you were not aware of its presence, the gold and silver and filagree work reflected to the eye outside the light showered upon them. There is, it seems to me, a very practical side in the relation between Washington street and the gas company.

I hasten on to one more phase illustrated in the Boston streets—viz., that of the Back Bay district, which is primarily a legalized intrusion of the body politic into commercial companies. There has grown up in these years of our interval much discussion on the functions of municipal powers, the relations of quasi public corporations to the charter givers, the essential and non-essential limitations of the charters themselves; and these are essential factors in the matter of gas consumption.

The first thought is the very obvious one in the matter of the displacement of gas in the street lamps, the number of lamps falling in 6 years from 18,000 to 13,000, with prices falling also, until the total income has now decreased to only 4 per cent. of the total amount of the entire gas income. The struggle was a short one between the lamps of the Siemens type and the arc light; less decisive as against the series incandescent lamps, but with the small sale and consequent increase in cost there is now little money in street lighting. Those gas companies which have electric adjuncts might. it seems to me, find some remedy in stretching a No. 8 wire, with the necessary lamps, further into the environs of the cities, and so increase their electric sales by a comparatively small investment at fair profits, in competition with the naphtha lamps. But the names of many of the larger towns are conspicuous by their absence from the list of gas lamps quoted in the report of 1893.

The more serious evil of the Back Bay district, however, lies in the ignorance of the people regarding the business and the strained relations of the Companies to the municipalities. An apt illustration can be given from the Boston *Record*, published Feb. 20, only day before yesterday, where it says that a certain Senator of this Commonwealth has put an order into the Senate asking that "a certain matter be sharply looked into by the Gas Commissioners." Now it is well known that this Board of Gas Commissioners deal at best but harshly with us. They analyze our accounts, they test our meters, they dictate the price of gas; and now, in what respect are they to be considered careless? I truly think it may be said to be unfortunate, at least both for the honorable gentlemen and the gas companies, that this charge now submitted to the Board is, in the words of the paper, "that the gas companies have some kind of a system whereby meters are forced up to a high pressure and so indicate the consumption of more gas than has actually been used." Could ever ignorance be more unfortunate?

The present hearing regarding the municipal purchase bill, which affects so largely the status of the gas industry, is due also to this ignorance of some of the fundamental principles of trade laws. The conception by the public, based primarily on scientific ignorance, has run out into a radical commercial error. All gases are apparently gas without distinction of illuminating power or gravity, and all gas can be sold at a profit, be it made by a person or a municipality, and this lack of discrimination has been fostered by unsatisfactory conditions of mutual confidence in which there were many interested. It is evident that some mystery yet attaches to the process of manufacture, and it is also true that no municipality has applied for proceedings under the present bill which has not felt itself ill-treated and aired its grievance. This feeling is but natural, perhaps; but it is based on the supposed exaggerated profits of the companies, which certainly is not supported if the figure 8.9 per cent. be the actual profits of the company, and might be allayed, as it often is, by the throwing open of the accounts to the proper officers,

to which I can conceive no special objection, provided other quasi public corporations share in the same rule.

But it must be borne in mind by all on both sides of the present discussion that the commercial success of a municipal plant has not yet been proven, and that a small municipal venture must be successful or not as its consumption or sales exceed the limit of dead expenditure and live costs; the first item being a very difficult factor in small plants.

Thus, I return to the broad proposition that the success of a gas manager lies primarily in his success in finding the niche which his product can satisfactorily fill, and the extent to which he has been able to keep the proper relation of consumption and employed capital; in other words, how well the varying moods of North street, Washington street and the Back Bay district may be consulted and provided for with the least expense of permanent capital.

The features of 1892 are different from those of 1886, as the amount sold per consumer varies from an average of 14,000 to 22,000 cubic feet, but there is something to consider in the variation of the year 1892, in different towns, from 12,000 to 30,000 cubic feet per consumer, and the consumption per mile of main from 36,000 to 10,406,000.

It may require a larger hope for the future, but there is ground for it, in that the immense inroad of oil and electricity has been after all so successfully met; but the energy displayed in the introduction of gas stoves and engines seems to me to foreshadow the continued success of the business, if carefully and considerately managed.

Discussion.

The President—We have all listened to the paper with a great deal of interest. Probably all believe that we know how to sell gas, but I think Mr. Taber has presented some problems here which none of us have exactly solved. I hope there will be a full discussion.

Mr. Stiness—I have in my own vicinity several miles of street mains that are ready to-day for business, but are of no earthly use, and bring no compensation to the Company. They represent dead capital. How to get that money back or how to get any returns from that investment is to me a very serious problem. We have tried various experiments. As we have a water gas plant, a coal gas plant and an electric light plant, we can give the people almost any kind of light. Our greatest competitor is kerosene oil, and as the people do not take kindly to gas, we send out our clerks to try to ring the customers in on the incandescent light. We fight oil with the incandescent light. There is a prejudice existing against gas companies, and the action of the government in Massachusetts, and of the Mayor in the city of Boston, has caused an excitement which has extended beyond the boundaries of the State of Massachusetts and has been of very great injury. This question of Mr. Taber's is one which, if we could only solve it, would bring back consumers on our lines of mains that to-day represent dead capital; and I think it would make our business increase—and that is what we are all laboring for. The man who can solve that problem will help us all.

Mr. Lamson—I think Mr. Taber's paper is an exceedingly interesting one, but it is not a paper that we can discuss offhand. There are many points in it I would like to discuss with him, and I rather think the only way to discuss it properly will be to write a paper in answer to it. The consumption of gas and its price, and the condition of the general lighting business in Massachusetts at the present day as compared with the business of 1886, is an extremely broad question to talk upon, and is in a measure a difficult question to discuss. If you look at the price of gas as it was in 1886, averaging something like $2.50, and at the price of gas in Boston to-day, $1 per 1,000 feet, and inquire as to how that reduction came about, you will find many factors in the problem. During this period electricity has come into very prominent use. It was a new thing and has been tried, and will very properly continue to be tried by men in business and in trade, who adopt all means which they think will help to sell their goods. And the use of the electric light has also been forced by the manufacturers of apparatus. They have extended electric lights in every direction, have formed companies as you are well aware, and very readily increased the amount of money invested from the 12,000,000, in 1886 (as I think Mr. Taber states in his paper), up to untold millions in 1894. I suppose that the millions that he gave us as invested in 1894 are the millions that are legitimately in use; the millions that have been sunk in electric light enterprises I do not suppose have been taken into account. Of course, we all acknowledge the great stride which has been made by electricity, and we all have an admiration for the energy, the study, the science put into the enterprises. I am inclined to think that the claim made for profits is perhaps a little too large. I have often heard the statement made that the only company making any money in incandescent lighting as a business was the Edison Company, of Boston; but I have been told that they have also passed their last dividend.

Mr. Stiness—No; reduced it.

Mr. Lamson—If they have only reduced it it is not quite so bad; but I have been told that they passed it. While this electric light business has been working against the interests of gas companies, great improvements have been made in kerosene oil burners; and I am inclined to think we are more injured by the improved kerosene oil burners than we are by electricity. The question of insurance has been spoken of by Mr. Taber. I suppose that the question of the rates of insurance being affected by the use of the electric light has come to a point where there is very likely to be some action taken on the part of underwriters.

Mr. Lane—If I understood Mr. Taber's paper, he states the average earnings of the gas companies of the State are between 8 and 9 per cent., and the average earnings of the gas companies, which are also doing an electric business, at between 6 and 7 per cent. Now I would like to ask him if he has figured so that he can give us the average earnings of the electric light companies alone?

Mr. Taber—I have not got the figures with me. I had them, and would have gladly brought them, for I am not afraid of them.

Mr. Neal—In speaking of the comparative cost of kerosene and gas, I will state that I was riding through Chelsea, with Mr. Woodall, an eminent English gas engineer, and while passing through a street where the class of houses was very good, I said, "I suppose in London, where they are selling gas at 60 and 75 cents per 1,000, all the houses of this character are using gas?" Said he, "No; not by any means. They are using oil." Exclaimed I, "Is that possible?—they were not cheap houses, but were a very good class of houses. Said I, "Is that possible in a land where gas is so cheap?" He said, "Yes; oil is largely used there."

Mr. Taber—I must say that I sometimes envy the petroleum wagoner, who goes around dumping a little oil here and there, getting paid for it; he does not have any "back kicks," as we may say, and no kickers; although I have found quite a strife between the various parties selling different kinds of petroleum, so that the kicking comes in even there. The answer to Mr. Lane's question is that the electric companies made, I think, 6 per cent. on the amount that they had actually invested—not, perhaps, on the amount of stocks and bonds issued.

Mr. Stiness—If there is no further discussion, I move a vote of thanks to Mr. Taber for his paper. (Carried.)

The President—We have as a topic for discussion "What value can be derived from coke and tar, if used for retort firing, steam generation, and in water gas generators?" The discussion is to be led by Messrs. Sherman, Fowler and Lamson. In a letter from Mr. Sherman he states that he had prepared some notes which he intended to present, but on account of sickness is compelled to stay away. His son has brought those notes, and I will ask him to start the discussion.

Mr. C. D. Sherman read as follows: With overflowing tar tanks and a limited demand, a serious question with the manager of a gas works is to know how to dispose of his surplus tar. We believe that with the return of business activity there will be a demand at remunerative prices for all the tar we have to dispose of. Those of us who live on the seaboard must face the competition coming from the importation of foreign tar, which can be laid down here at a cost of $2.25 per barrel. To this must be added profit, storage and handling, which will bring it to a price we can meet without seriously cutting our prices. In the AMERICAN GAS LIGHT JOURNAL we have of late seen considerable unfavorable criticism of tar trusts or syndicates. As we, here in the East, have no knowledge of their existence, each company selling its tar to its customers on the best terms it can make, we presume the remarks apply to our Western brethren, who feel that they are oppressed by such combinations of buyers. Now, in regard to the price of tar; each company should be in a position to make a minimum price below which it will not sell. To do this it must be fitted up to burn it. Here comes in another element of the value of liquid fuel. Its value must be measured by the solid fuel it displaces; that is, the price you can dispose of your coke will determine the price of your tar. In my experience I have found that one gallon of tar is worth one-half bushel of coke for fuel purposes. If coke is worth 8 cents a bushel, tar is worth 4 cents a gallon to burn. This ability to burn our tar makes us indifferent to any adverse combinations in regard to its value. We know what it is worth to burn, and we will not entertain any offer below that figure. With us the dull times have made an increased demand for coke for domestic purposes, and our coke sales have increased and our tar tanks are overflowing. In regard to firing benches with tar fuel, there is no secret about it. I presume most of the members present have tried it more or less successfully. I have used it with and without a steam jet. I prefer the steam jet got up by

Mr. Vanderpool. The tar should be strained to remove all lumps and foreign substances. In reference to injury to retorts by this method, I would not advise putting the steam jet into new settings. Tar without the steam jet can be introduced without any injury to the settings either old or new. I intended to bring before the Association a record of tests of tar for use under boilers; but a prolonged attack of the grippe has prevented. I have used Lima oil tar under boilers. With a proper adjustment of the furnace gas tar can be successfully used.

Mr. Fowler—I have very little to say on this topic, for I have had no experience with tar. All our coke is used for the production of steam under boilers, and our experience agrees with that of some of the gentlemen who spoke yesterday in the discussion of the paper read by Mr. Humphreys—that the coke is worth about 10 per cent. less under the boiler than good bituminous coal.

Mr. Lamson—The Secretary has asked me to give the Association a few figures with regard to the value of coke and coal tar for fuel, and I have taken some data from our results during the past month or two. Taking a good bench of retorts, working off a charge of 300 pounds per retort in 4 hours, our different experiments show that the consumption of coke is from 52 to 60 bushels in 24 hours. If we put a price on the coke of 11 cents per bushel, 52 bushels in 24 hours would be $5.72, working off 10,800 pounds of coal, which is at the rate of 5.3 cents per 100 pounds of coal. Near that bench we had a bench of retorts heated by the use of tar; it requires 100 gallons of tar and 24 bushels of coke in 24 hours. This bench works off 12,600 lbs. of coal. To work off this amount of coal by use of coke alone we find would cost $6.67. Now, taking the 24 bushels of coke at 11 cents per bushel, and deducting that from the $6.67, we have $4.03 as the value of 100 gallons of tar. In another case it is $4.29. This shows that the tar is worth at least $2 per barrel to burn. There are other advantages to be credited to the use of tar for fuel. I understand I am also desired to state the relative values of coke and coal in the manufacture of water gas. The figures from our works are something like the following: In the month of December, 1893, the average amount of coke in the generator was 39.1 pounds per 1,000 feet of gas. All the cinders we get from the generator are sifted and are used for firing the boilers. We find that we can get 6 pounds of cinders and screenings from the 39.1 pounds of coke used in the generator. That has a certain value. We find it very good fuel for boilers when mixed with coke and fine coal screenings. That is, 39.1 pounds of coke are put into the generators, and 6 pounds of cinders are taken out for use at boilers. The efficiency of the apparatus is at the rate of 580,396 cubic feet in 24 hours from one generator, an 8½ foot set. The consumption of oil was 4.5 gallons. Another coke experiment for 26 days in January, 1894, gives 37.8 pounds of coke and 4.3 gallons of oil made at the rate of 609,138 cubic feet of gas in 24 hours from one set. An experiment with coal, from January 6th to February 15th, 1894, inclusive, gave results as follows: We put into the generator 45.4 pounds of coal; cinders and screenings taken from the generator for use under the boilers, 12 pounds. The average make of gas for this period for 24 hours was 642,800 cubic feet. Of naphtha we used 4.4 gallons. Our candle power is practically 22 candles from water gas; mixed with coal gas gives commercial gas, averaging close to 20 candles.

Mr. Neal—I would like to ask Mr. Lamson if he uses tar for firing exclusively?

Mr. Lamson—No. We are at present only using one bench—burning it only under one bench.

Mr. Neal—What percentage of the coke which you make do you use under your benches?

Mr. Lamson—I have not taken the figures that way.

Mr. Neal—I thought of putting in regenerator furnaces in order to save coke, but on making the test lately I find that I use about 38 per cent. with the ordinary bench. The settings are perhaps a little peculiar. It is a question with me whether the half regenerator furnaces will pay. I would like to know if that is about the proportion with regenerator furnaces and half regenerators.

Mr. McKay—I think the figures which the gentlemen have given as the actual monetary value of tar as a liquid fuel for the purposes of steam generation show surprisingly excellent results, and for this reason: I do not know the ultimate composition of coal tar, but water gas tar is about .86 carbon and .14 hydrogen. Using those percentages, and taking as values for producing heat units 62,000 for hydrogen and 14,500 for carbon, we find that the total value of water gas tar per pound is 21,150 heat units. Now, pure carbon, or the best coal that we can get, would have a value of 14,500—supposing it to be burned entirely to carbonic acid gas. Of course, in practice we do not get this out of even the best boiler, because there is a loss of 400 to 500° of stack temperature, and the steam of the stack gases has also latent heat. One pound of tar is equal to $\left(\frac{21,150}{14,500} =\right)$ 1.47 pounds coal; then, if the gallon of tar weighs 8.5 pounds, we find that it is equal to 12.5 pounds of pure coal. Now, in the case of coal gas tar, it is probable that the percentage of hydrogen is much less; consequently the value of tar per pound for producing heat must be less. But if this tar weighs 9.5 pounds per gallon, you find that it is equivalent (supposing that it has hydrogen and carbon just the same as water gas tar) to 14 pounds of coal. Knowing how many pounds of coal are worth 1 cent, one would think that the value of tar would be only 2 or 3 cents per gallon. So that when they get 4 cents a gallon back from generating steam, the work must be effective partly on account of the manner of the distribution of the fuel.

Mr. Humphreys—In the manner of burning tar in place of coke, of course there is a chance for a good deal of misunderstanding as to the value of the tar thus burned, because one man may have used a great deal more coke than another. We are heating all our benches now with tar, and we use in a bench of six retorts 70 gallons of tar and about 8 bushels of coke in 24 hours, and produce from 48,000 to 50,000 feet per bench. From that you can figure out what the tar is worth to us.

THE QUESTION BOX.

The President—Question No. 1 is, "What is the fair percentage to charge off for depreciation on small gas plants?"

Mr. Taber—In New Bedford for many years we have charged off 2½ per cent. depreciation on capital.

Mr. Coffin—Our custom has been that when our construction account exceeded our capital more than the quick assets to charge it off as depreciation.

Mr. Coggeshall—The custom in our Company is to charge off everything over and above the dividend.

Question No. 2.—"From practical experience, what is the best method of introducing gas stoves both for heating and cooking?"

Mr. Stiness—Send a canvasser out.

Mr. Fowler—Prior sales of gas stoves seem to me to be the best advertisement. Our gas stove sales increase almost geometrically every year, and have for the last five years. We find that one stove sells two more.

Mr. Nute—We have had some experience in Fall River, though not as much as we wish. We have been setting a good many stoves, particularly during the past two years. I find the most successful method we have is to send out a man to canvass. He is a man who is thoroughly acquainted in town, and makes a business of selling gas stoves during the season. We give him his time to attend to that particular gas stove business. He sells more gas stoves than we can sell by any other method. Of conrse we advertise in the papers and send out circulars with the gas bills about the time the gas stove business begins, and we sell more or less stoves through the office; but most of our sales are through a man who does the work of soliciting on the street.

Mr. Taber—We had our room arranged at New Bedford so that it required every man who came in to pay his bill to pass by a row of gas stoves, and we found that method of advertising them quite effectual.

Question No. 3.—"What advantage has wrought iron pipe over cast iron for street mains?"

Mr. Stiness—Knowing that this matter was coming up I prepared some data, but in some way have lost the paper which I intended to present. It is a very important matter, and is one worthy serious consideration. I have experimented with and used a good many wrought iron mains, and I believe that the cost is not below the cost of cast iron, but it has very many advantages. I do not know that it has the advantage which I heard mentioned the other day, when a very distinguished official in the gas business stated that, in Brookline, where the soil was made of tin cans, the street mains were screwed the wrong way, so that when the soil settled they leaked. That is, the threads were cut the wrong way, and so when the ground settled the joints drew out. I think Mr. Printz has published a work on cast iron and wrought iron mains. They are making wrought iron to-day in very strong pipes, and if it is well covered with tar on the outside it has an advantage. Perhaps many of you have noticed that the heavy street rollers used in making the roads sometimes break the pipes when passing over the roadway. There are many other advantages. It is a question which we have hardly time to discuss to-day. I am sorry that I have not brought with me the figures that I prepared.

Mr. Learned—Which do you use, the thick or the double-thick pipe?

Mr. Stiness—The double-thick.

Mr. Learned—I got some figures not long ago from a manufacturing company as to the cost of pipe, and found that the single-thick pipe was

about the same price as cast iron, but that the double-thick was of additional cost.

Mr. Stiness—But there is a saving of labor, not only in excavating and boring holes, but in yarn.

Mr. Allyn—During the past two years or more we have been enjoying the luxury of having two systems of sewerage introduced into different parts of our city, and our mains have been broken almost innumerable times. It may be useful for some of the members to know of a plan we have adopted, where the sewers have crossed our mains. We remove a section of cast iron pipe and replace it with wrought iron pipe—letting the pipe run out 6 or 8 feet on each side of the trench, placing a timber under the pipe to prevent springing. In every case this plan has proved efficacious. In one case we had a main break three times in a month. We replaced it with wrought iron pipe and that obviated all the trouble. The expense is very slight, and yet it does save a great deal of trouble and annoyance.

The President—The fourth and last question is, "Can anyone give the percentage of fast meters found in use?"

Mr. Stiness—The State Inspector speaks in his report of re-inspecting a much larger number of meters than ever before in any one year. I find the papers have taken that up and have raised a great hue and cry that "the meters are all wrong." I have been informed that during the past year a gang of fiends have been going through the State inspecting meters; that is, they would go to a house, store or factory and ask those in authority if they wanted to have their meters tested. They would test it by another meter, making the statement that if it was found correct no charge would be made; if found incorrect they wanted a dollar. They never found one correct; for, of course, then they would lose their dollar. I understand that that is the cause of the large number of meters being re-inspected this year. As I say, the impression has gone out that a vast number of meters are wrong. I think 570 were re-inspected. A certain number were found fast. If the public could be informed of the number that were found fast in relation to the number of meters that were in use in the State of Massachusetts, it would be found that the number of meters that were wrong was almost infinitesimal. I think the State Inspector owes it not only to himself, but to the State and to the gas companies, to make a correction of that statement, or to give to the public the precise number of meters that were found fast in proportion to the whole number in use. It should be brought to the attention of the public that out of the large number of meters in use in Massachusetts (I think some 87,000), only so few were found fast. I think the Inspector has given the impression that there never were so many meters found incorrect before in the history of 20 years. Undoubtedly the large number re tested was caused by these fiends going around and testing meters by another meter, and if the meter was about right making no charge; but they never found things right, because then they would lose their dollar. I think if this could be known it would give us some information by which we could meet the clamor with regard to meters being fast.

Mr. Taber—Does Mr. Stiness remember how many were recorded as fast? Is this the data for 1893, or for the present year?

Mr. Stiness—For 1893.

Mr. Allyn—I have the figures. I am very glad this matter came up. I felt it very seriously, and have no doubt every other gentleman in the State interested in the gas business felt as I did—that while we have every confidence in the Inspector's ability, and that while we believe he is a gentleman and honest in his convictions, and do not think that he intended to do any injustice to the companies—yet, at the same time, we feel, when so many members of the Legislature seem bound to do what they can to wreck our industry, and when every paper in the Commonwealth is flooded with incendiary articles, that the Inspector ought to have thought twice before he spoke once. The figures which the gentleman has called for I will read, in the Inspector's own words. He says: "Meters in use are subject to re-inspection by the State Inspector on complaint of a consumer or a gas company; notice is taken as to whether the condition of the badge and seal indicate any alteration of the rate of registration. Of this class there were 531 meters tested last year. The results given below would indicate that more attention should be given by many of the large gas companies to the frequent testing of the consumers' meters. Of the 531 meters re-inspected, 3 would not register; 1 varied from 4 per cent. fast to 18 per cent. slow; of the remaining 527, 284, or 53.9 per cent., were correct within the 2 per cent. limit, and were sealed and stamped anew; 197, or 37.4 per cent., were fast, registering against the consumer, the average error being 5.1 per cent.; 46, or 8.7 per cent., were slow, the average error being 9.3 per cent. The average error of the 527 meters tested was 1.23 per cent. fast. Excepting for the year 1875, this is the highest average per cent. fast for 20 years." Now, let us condense these figures. He found correct, 284, or 53 per cent. of the whole number; fast, 197, or 37 per cent. of the whole number; slow, 46, or 8 per cent. of the whole number. Now, it would have been the easiest thing in the world for the Inspector to have simply added the statement that the supposition when these meters were sent in to him was that the whole 531 were fast. No man who has a slow meter in his house is going to complain to the gas company or to the State Inspector. Every one of those meters was probably sent in because the consumer thought that the meter was running fast. Does it not speak well for those meters that 284 out of 531 were correct, and that 46 were slow? I claim that it does. In our own experience we have this year tested every meter that has been taken out. We have tested 697. Of those we found that 454, or 65 per cent., were correct; that 113, or 16 per cent., were slow; that 130, or 19 per cent., were fast. There were only 130 fast out of 697. Those meters, of course, had been in use from perhaps a month to 15 years.

Mr. Taber—In the returns for 1892 it appears that the total number of meters sent out in the State was 87,000. If, then, there are only 187 reported last year as being .2 of 1 per cent. fast, I think it is scarcely worth while to discuss it.

Mr. Allyn—I want to add to what I said that the result of this wording of this report was shown the very day after the report was presented to the Legislature. One paper asked, "Why cannot the State Inspector explain to the public why it is that so large a majority of the meters inspected are fast?" Another paper said, "It is conclusive in reading the State Inspector's report, that as he derives his income from the gas companies, he naturally leans towards them. As much as to infer that he took his pay from us, and he regulated the meters accordingly.

Mr. Lamson—I want to say a good word for the State Inspector, and then I want to say a word as to his report. Mr. Jenkins is an excellent man for his position. I believe him to be conscientious in his work, perfectly honest, and a gentleman. I do not think he would knowingly do anything which would injure any of us. It is simply a mistake the way he has expressed himself in his report. I do not know whether he could be persuaded to issue any statement with regard to it; I doubt if he could. Unfortunately the statement is made in the first place that the gas companies do not test their meters often enough, when the real fact of the case is that every gas company tests its meters as often as it possibly can; and it is for the interest of the company to do it. An important matter in this connection has been spoken of by Mr. Stiness—the influence of the men who are running loose around the country testing meters. I am sorry the Inspector made the statement "that a certain number of meters were 1.23 per cent. fast, which is the largest number in any one year (except 1875) for the last 20 years." It seems to me that that was an entirely needless statement, for the reason that that is entirely within the limit fixed by the law (2 per cent. fast, or 2 per cent. slow); and the fact did not require any statement at all from him. I think that was a serious mistake. Possibly some such man as Mr. Allyn might induce him to make an explanation of his figures before the public. It might be suggested to Mr. Allyn by the Association that he make an effort to get him to do so.

Mr. Neal—If I had known this question was to be asked I would have brought some figures and statements from the State Inspector, showing that a very large proportion of the meters inspected by him in the last year were correct. It was suggested to some Association of which I was a member that the questions that were to be asked through the Question Box should be sent to the members before the meeting, so that they might be prepared to answer them. This is a question that I would like to have had knowledge in advance that it would be asked.

FEDERATION.

The President—As you all know, the Council of the American Association have appointed a Committee on Federation, to take into consideration the subject whether anything may be gained by joining the Associations together—not under one head, but by bringing them closer together than they are now. As we shall not meet again for a year, it has seemed to the gentlemen who have this federation scheme in charge that it would be desirable to appoint a committee, not with power to bind this Association, but to consult with the Committee of the American Association and report at the next meeting. With that in view a resolution has been prepared which will be read by the Secretary.

The Secretary (reading)—"The Council of the American Gas Light Association, having appointed a Committee on Federation to report on a general plan to effect the same, the President of the New England Association is empowered to appoint a Conference Committee to report to the New England Association as to the desirability of federation, should the matter be brought before the Conference Committee."

The motion was adopted and the President appointed as such Committee Messrs. C. D. Lamson, C. J. R. Humphreys and C. F. Prichard.

The President—I have been requested by Mr. Addicks, as the Chairman of the Committee of the Council of the American Association, to bring this matter before the Association, that, if possible, we might get some expression from the members of the Association before the next meeting on this subject of federation by means of a postal ballot—sending a statement to each member and allowing him to send his vote by mail. I would suggest that the matter of taking the postal ballot be left to the Committee, with power to act.

Mr. Stiness—I move that the Committee be empowered to act.

The President—It is moved and seconded that the question of taking a postal ballot on the matter of federation be referred to the Committee just appointed, with power to act.

Mr. Allyn—Is it intended by that motion to make the result of that ballot binding, or is it intended merely as an informal ballot?

The President—I think we can safely leave that to the Committee.

Mr. Allyn—I think it ought to be decided by the Association.

Mr. Stiness—I think that this matter of federation is not very well understood by the members of the Committee. Of course, when the postal ballot goes out that information will be given to the members. The ballot will be informal. The report on that ballot will be made at the next meeting of the Association. There would be nothing binding in the ballot itself.

Mr. Allyn—I did not know but that the object of taking a ballot between two sessions was to expedite the business and to make it binding.

The President—I think that is the object.

Mr. Stiness—To bind the Association to a federation?

Mr. Lamson—No; that is a long way off.

The President—The vote which will be cast by mail would be binding upon the Association, just as if it had taken place at this meeting; but I think that the members can safely leave this to the Committee.

Mr. Slater, Jr.—Would that vote be taken by the Committee directly, or through the Secretary?

Mr. Stiness—That is a matter for them to determine.

Mr. Slater, Jr.—I have heard this matter of federation mentioned amongst the members, and the idea seems to be very common that the federation Committee have on their hands a scheme for amalgamating all the Associations. From my connection with other Associations I would like to say that their work is not to amalgamate the several Associations in any sense, but the object of the federation is simply to organize a systematic means of co operation among the Associations, and not to merge the Associations into one. It is simply to devise and organize means of co operation amongst the various Associations; and the individuality of no Association will be in the slightest degree interfered with.

The President—Mr. Slater has expressed just the idea. There is no intention of wiping out the New England or any other Association. The resolution of Mr. Stiness is adopted.

Mr. Lamson—It seems to me there is some misunderstanding with regard to this postal ballot. I think the Association should agree that if a postal ballot should be decided upon and taken, we should stand by the result of that ballot just the same as if it were a ballot taken here at a meeting of the Association, otherwise we must agree here and now that no ballot can be taken. There may be no important matter come up; but if a ballot should be asked for by the Committee which has been appointed, and the members should signify their wishes on such ballot, it should be understood here and now whether the Committee is to act according to the result of that ballot.

The President—It is my understanding that if a ballot is taken it is just as binding on the Association as if it were taken here at the meeting. If that is not the understanding of the gentlemen present I hope there will be some motion offered to correct it.

Mr. Lamson—They must understand that distinctly, if the Committee act.

The President—Is there any objection to letting the Committee understand distinctly that if a ballot is taken it is binding upon the Association?

Mr. Taber—All of the members of the Association are not here, and it seems to me it would be better to leave this matter to a fuller meeting of the Association. For my own part I confess that I do not understand this federation scheme. I have no doubt it is all right, because it is in very able hands; but at the same time are we justified to-day in taking a vote on the subject, without a fuller discussion, and in the absence of so many members?

Mr. Lamson—It would not have any effect on the question of going into the federation. As I understand it this thing is liable to be a long-winded matter. The only question that can come up requiring a postal ballot might be on some point in the Committee—such as authorizing the Committee to act with another Committee, or something of that nature. But unless you so understand it the Committee would not feel at liberty to use the postal ballot as committing the Association. There could be no question that any Committee would dare to draw this Association into any federation without first bringing the matter before a meeting of the Association. It is only on some minor matters that a postal ballot may be thought desirable.

Mr. Taber—If that is the way it is understood I will withdraw my objection.

Mr. Slater, Jr.—The matter of a postal ballot is something which I believe is practiced very largely by other Associations. For instance, in the largest engineering Association in the country, the American Society of Mechanical Engineers, on any matter which comes up before their Council, or before such a committee as they may appoint for a special purpose, the nature of which demands action to be taken before the time of the regular annual meeting, an explanation of the business is given to the members in printed form, so that they may all have a clear understanding of what it is, and then a ballot is called for by the Secretary, and taken through the mail, and such a ballot is considered to be just as binding and just as legal, as far as the affairs of the Association are concerned, as though the members had been present at a meeting and balloted by the showing of hands, or in any other way—the only difference being that, of course, the nature of the case renders a general discussion of the subject by the members a very difficult thing to have. The matter has to be presented to them by their Council or by a committee, and then each man acts on his own good judgment after the matter has been presented to him; and if he wants further explanations before voting, he corresponds with the Executive Committee or Board of Directors, or whatever the managing board of the Association may be termed.

Mr. Taber—Then, understanding it in that way, I move that, within such limitations as have been offered by the Committee, the result of any postal vote shall be binding on this Association.

Mr. Slater, Jr.—It strikes me that the wording of the resolution makes it apply to, or implies that it refers particularly to the special business in hand, and not, as I expect will be done in one or two other Associations of which I happen to be a member (in imitation of the Society of Mechanical Engineers), to facilitate any business that may come up, but not for a particular purpose. If I misunderstood the resolution I would like to be enlightened, but it struck me as being something which would apply to a particular case in hand rather than to matters in general.

The President—I think it does; but I would suggest that it is rather a late hour, and we have so little time left that it is hardly worth while to discuss that. Would it not be better, if you wish the Association to debate it, to refer it to the Board of Directors and let them report on it in their annual report to the Association, and submit a resolution adopting or condemning the whole general matter; but let this go through as applying to this particular subject this year.

Mr. Slater, Jr.—I do not object to it all.

The President—The question is upon Mr. Taber's resolution. (Carried.)

The President—Is there any further business before the Association?

Mr. Slater, Jr.—I would like to present one matter for the consideration of the Association. The American Association, through their Council, have made a new and amplified arrangement for the publication of their proceedings. In order to facilitate the business at the annual meetings, many of the papers to be presented before the Association will hereafter probably be read by title only instead of being read in full, on account of the manner in which they will have been published and distributed. Thus the Association will probably have more time at its disposal for the consideration of matters brought before it, and have thought it advisable, if we do have such time, to use it, or a part of it at least, in the consideration of interesting matters that have been brought before other Associations, provided the other Associations are willing that such matters should be brought up for discussion in the American Association. It is, therefore, because of our desire to secure that privilege from the New England Association that I now state that the Council of the American Asssociation desires to bring before it for discussion a selection of the papers read before the New England Association. Of course they do not wish to commit you to permitting all the papers read before this Association to be thus brought before the American Association; but the Council would like to have the privilege of selecting occasionally a paper from those which are presented at each of the other Associations for consideration by the American. I would like to ask the New England Association if they will grant that privilege to the American—to its Secretary and Council—to occasionally present to the Ameri-

can Association for consideration and discussion such papers as have been presented to the New England Association as they may wish to select.

Mr. Gifford—I move that that be referred to the Directors, with power.

Mr. Slater, Jr.—In that connection I would state that I suppose the essential point would be to secure permission from the New England Association for this to be done, and also that the authors of the papers should be consulted. The course which will be taken by the American Association would probably be this: If a paper is selected by the Council and approved by them for discussion by the American Association, of course, in order to present it to the members that paper would naturally have to be printed in their publication, and issued to the members in order that they might read it before the meeting—as many of the papers will hereafter probably be read by title there instead of being read in full, unless specially so called for. Then the paper would be read by title and discussed in the American Association just the same as any other paper which might be presented by its members.

Mr. Stiness—Cannot all that be done by the Directors?

The President—In case this permission is granted, I understand that the publication would be made long after the paper had appeared in the gas journal, so that it would in no way interfere with the present arrangement.

Mr. Slater, Jr.—We have not the slightest desire to anticipate anything that belongs to the New England Association. We would select the paper only after it had been presented to and discussed by the New England Association to its full satisfaction, and after it had been published in such papers as the New England Association wishes it to appear in.

The President—It is moved and seconded that the request of the American Association be referred to the Directors, with power to act. Is there any further discussion? (Carried.)

The convention was then declared adjourned.

Coal in Colombia.

Mr. C. F. Z. Caracristi, in speculating on this subject, remarks:

Looking at the map of Colombia, we see a great indenture on the Atlantic coast of the department of Cauca, formed by the Gulfo de Uraba, or Darian del Nord. Into this gulf flow the Atrato Arboletes, Punta de Piedra, and many other small streams. I consider the territory embraced within latitude 7° 30′ and 9° north, and longitude 2° and 3° 15′, meridian of Bogota, as containing the most promising coal deposits of the Atlantic coast of South America. The coal measures expose themselves from Cabo Tiburon, on the borders of the department of Panama, and follow around the gulf and shore; traversing the various rivers, and entering into the department of Bolivar after coursing the Arboletes. From here the coal extends to the Rio Magdalena, following the geological base of the hills from the valley of the Atrato. On its way through the department of Bolivar, the coal is exposed when it crosses the Rio Sinu and Cannaletta.

The coal which I explored on the Uraba coast was, first, a large deposit which exposes itself about three miles from the mouth of the Rio Punta de Piedra. Here the inundations have washed a small canon through which the river flows, and on the banks of which may be found carboniferous outcroppings. Secondly, a large and well-defined extension of the deposit of Rio Punta de Piedra, on the right bank of the Rio Volcan, at its confluence with Rio Arboletes, four miles from its point of emptying into the gulf. At this point the veins of coal are from 3 to 20 feet thick, and extend southward a distance of not less than 60 miles. Thirdly, I examined the coal of the Atrato; but, owing to the rise of that river, I was unable to learn, with any degree of precision, the nature or geological condition of the deposit. Fourthly, I discovered large veins of coal on the Rio Sinu, and excellent coal on the Rio Cannaletta.

In Cauca there are upwards of 20 veins of coal—anthracite, bituminous and lignite—all of which has more or less commercial value. In their whole distance along the Darian in Cauca and the shores of Bolivar to a point opposite Puerto de Columbia, the coal measures have a length of 260 miles with an average width of 30 miles. This gives a square mileage of 7,800, or a coal area equal to that of Alabama. At a distance of about 6 miles from Rio Caiman, in a northwardly direction, the carboniferous strata showed a "pinched" condition, and are somewhat distorted and irregular, doubtless from the effect of recent volcanic dislocations. The same may be said of the coal measures where they cross the Rio Varacuarando, above Turbo, to the south. On the Rio Arboletes and the Volcan, the "droppings" are even more wonderful than those of Pennsylvania, or, in fact, any I have had occasion to examine during my professional career of more than 13 years.

The following are the analyses of the coal of Uraba:

Sample from Arboletes.	Per Cent.
Sp. gr., 1.62	—
Fixed carbon	41.50
Ash	6.11
Volatile matter	50.33
Water	2.06
Total	100.00
Color of ash, white alkaline; quality of coal, black lignite.	
Coke	49.30

Sample from Punta de Piedra.	Per Cent.
Sp. gr., 1.81	—
Fixed carbon	77.52
Ash	7.31
Volatile matter	12.41
Sulphur	0.26
Water	2.50
Total	100.00
Color of ash, yellow; quality of coal, anthracite.	
Heating power	60.92

The coal follows the coast line at a distance of from 3 to 40 miles. I would estimate the visible supply at not less than 18,459,200 tons in the department of Cauca and Bolivar alone. The cost of mining the coal I place at about $2.10, as against $1.62 in Pennsylvania.

At a distance of 2 miles south of Santa Maria, at the base of the mountains, I found the first coal cropping in the form of a vein of lignite, bearing with it cannel coal, which, upon development, I believe will be found to be a valuable deposit.

At Rio Fundacion, about 1½ miles above the abandoned village of the name, the coal measures assume a proper and healthy form, and exhibit large veins of coal for a distance of 6 or 8 miles up the river. The total distance from Santa Maria to Rio Fundacion is some 70 miles, about 60 of which are on the coal measures. In the Val du Par, too, I discovered extensive beds of the best quality of cannel coal.

On the Petrale canon and on Rio Fundacion, I entered into extensive excavations, which proved the coal to exist in well-defined veins, and the "hanging" and "foot" wall to be of healthy sandstone, which necessitated but little timbering in the working of the coal. These mines are extremely valuable, owing to the fact that they exist at a healthy elevation above the sea, are supplied with cold water from the glacier of Santa Maria, and are on navigable rivers and on the line of a railroad now under construction from the porte of Santa Maria. The analysis of the coal of this region speaks for itself: Fixed carbon, 34.85 per cent.; ash, 7.35 per cent.; volatile matter, 57.80 per cent. The coal will not coke; it gives a white ash, and is peculiar in the fact that it ignites under a heat of 270° F. The carboniferous measures of this region extend along the coast of Venezuela to the Lago de Maricaibo, where an English Company is opening up the mines.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THEODORE MESSNER and others interested in the Warren-Chautauqua (N.Y.) Natural Gas Company are endeavoring to secure a franchise for an opposition natural gas company at Jamestown, N.Y.

MESSRS. J. W. Wetzel, Frank Gardner and D. B. Stevick have been chosen Directors of the Carlisle (Pa.) Gas and Water Company.

THE Chicago *Herald* of March 8th says: "The Hyde Park Mutual Fuel Gas Company seems to be determined to make every effort to get an ordinance through the Council granting it permission to extend its mains through the downtown district and the north and west divisions of Chicago. Frederick F. Haskett, President of the Hyde Park Company, H. N. Higinbotham, Jesse Spalding and Joseph Leiter had a long conference with the Mayor yesterday on the subject of the new ordinance. The visitors assured the Mayor that if the ordinance was passed they would supply gas at $1 per 1,000 net, and light the streets at $16 per lamp. The Mayor asked them if they would accept an ordinance fixing the price of gas at 90 cents per 1,000, and they replied emphatically that they would not. They promised if the ordinance was granted them to go to work immediately and spend $1,000,000 the first year in construction. They also agreed to enter into a solemn obligation not to sell their franchise. They were very anxious to know what would be the Mayor's probable action concerning the ordinance if it passed the Council. Having failed to find anyone to introduce the ordinance, because those approached said it did not meet the Mayor's views, as set forth in the veto of the Watson ordinance, they appealed to the Mayor to know what his objections are. He told them he was not making legislation for the Council."

THE New Jersey Zinc and Iron Company has placed the order for the iron roofs at its new buildings with the Berlin Iron Bridge Company, of East Berlin, Conn. The furnace room will be 50 feet wide and 400 feet long, made entirely of brick and iron. The engine room, fan room

and boiler room will be 60 feet wide and 187 feet long. The engine room will be covered with slate, and the fan room and boiler room will be covered with corrugated iron.

THE Milwaukee Gas Light Company was incorporated in 1851, and gas was first distributed there in 1852. Before the war the selling rate was $2.50 per 1,000 cubic feet, but during the troublous times of the rebellion the increased cost of materials and the high rates of wages paid sent the price up to $4.50 per 1,000, where it remained until 1870, when it was lowered to $4. In 1871 the price was put at $3.75, and later in the same year to $3.50. In 1872 there was another cut to $3.30. This was the schedule until 1875, the rate then going to $3; in 1876, to $2.50; in 1878, to $2.25; in 1882, to $2; in 1883, to $1.80; in 1884, to $1.60; in 1885, to $1.40; in 1888, to $1.20; in 1891, to $1 per 1,000 for illumination, and 80 cents per 1,000 for fuel and power, which schedule is the one now in force. The Company's sendout at the 80 cent rate is fully equal to 42 per cent. of the total output.

AT the annual meeting of the Malden and Melrose (Mass.) Gas Light Company the following officers were chosen: Directors, George D. Bill, Daniel Russell, L. D. True, E. A. Hildreth, S. B. Hildreth, Vinton W. Mason, George W. Mason, George W. Walker and J. H. Converse; President, E. A. Hildreth; Clerk and Treasurer, Vinton W. Mason.

AN explosion in the water gas plant of the Washburn & Moen Manufacturing Company, Worcester, Mass., is reported. Three workmen were seriously injured, but the monetary loss is slight, since it will not exceed $500. Back pressure was the cause of the explosion.

ENGINEER BARRET, of the Louisville Gas Company, has been doing some quiet investigating of late, with the result that he discovered four instances in which gas was being used without the names of the consumers appearing on the Company's books. He will not prosecute the offenders, although under the franchise it is provided that delinquents of this sort may be fined $100 or imprisoned in the workhouse for one year, or both, according to the view of the crime taken by the judge before whom the conviction was had.

A CORRESPONDENT at Memphis, Tenn., under date of March 8th, forwards the following: "The Memphis Gas Light Company filed a petition in the Circuit Court yesterday against J. J. Williams, County Trustee, and J. P. O'Conner, a constable, protesting against taxes amounting to $2,403. The petition states that a distress warrant has been placed in the hands of O'Conner, and while the petition does not state the year for which the taxes referred to were levied, it was learned in the Trustee's office that the taxes for which O'Conner had levied on property of the Company under a distress warrant were State and county taxes for 1893. The petition goes on to say that the levy complained of was made under the Act of 1889, which requires that quasi public corporations such as gas works, etc., shall pay an ad valorem tax on the full value of its capital stock (including its franchises, easements and incorporated rights and corporate property, as a part of such capital stock), which shall in no case be held or deemed to be less than the actual value of its bonded indebtedness; provided that the shares of stock in such corporations shall not be assessed for taxation, but their value shall be looked to in arriving at the value of its State capital stock (including its franchises, easements and corporate property as a part of such capital stock). But in assessing the capital stock as provided in this section a reduction shall be given for the value of its real estate, assessed in wards, districts or counties, other than districts, wards or counties in which such corporations are located. The petition claims that the Company was assessed in the 3d ward, where the general business of the Company is conducted, but where it has only safe and office fixtures, the full value of its corporate stock, together with all bonded indebtedness, $250,000; in the 1st ward, $100,000 realty and $150,000 personalty. The petition continues and states that the Company's statement showed the value of the real estate of the Company in the 1st ward to be about $100,000, and including personalty, all the improvements to be worth about $100,000; the bonded indebtedness $240,000; but not a dollar of these bonds were or are now owned by the Company; that it further shows that of the number of shares of stock, amounting in round numbers to $750,000, which were worth on the market on the day of the said assessment about 30 cents on the dollar, more than one seventh were owned by parties residing outside of the county and State, and are not assessable here by law; and further, that no dividends have been declared for over two years. The reasons set forth for complaining of the assessment due: 1. Because it is not in conformity with the Act of 1889, as it fails, after concluding what is a proper valuation of the capital stock of this Company, under the said Act, to credit this assessment with the real estate valued by the assessors at $100,000, located in the 1st ward, as provided in the said Act. 2. The assessor assessed the market value of the shares of the stock of the Company on what the shares of stock were worth at par, when the said stock was worth only about 30 cents on the dollar on the day of the assessment. 3. Because the said assessment was made on the basis that the entire stock was owned in the city of Memphis and the State of Tennessee, when, as a matter of fact, more than one-third was owned outside of the county of Shelby and the State of Tennessee, and non-assessable under the law in the county of Shelby and city of Memphis. 4. The said Act of 1889, under which the said assessment was made, is void, because it is unconstitutional in this: It requires the assessor to place a tax on the value of the bonds of the Company. The object of the law is to tax what a person owns, and not on what he or it owes. It is shown herein that the Company does not own either or any of these bonds, and this tax is not a liability that the Company is required in law to meet. 5. The paper purporting to be a distress warrant upon which the defendant O'Conner considers and is acting upon as an authority to give him power to invade the premises of petitioner, is not such an authority as is authorized by the Constitution of Tennessee. 6. The said assessment is otherwise erroneous and void because (1) the same is a double assessment, both as to realty and personalty, as to the shares of stock and the capital stock, and all other property of the Company; (2) because the assessment of this Company is not in conformity with the statutes of the State and the general law respecting the assessment of the property of corporations; that is to say, neither the real estate, the personalty, the capital stock, the shares of stock, nor the rights, privileges, immunities or franchises of this Company have been assessed according to law. The petition then claims that O'Conner has levied on the property of petitioners and is about to sell the same, and asks for a writ of certiorari and supersedas for a suspension of the distress warrant, and to have the levy and assessment set aside."

AT the annual meeting of the Sedalia (Mo.) Gas Light Company, the Directors chosen were Messrs. James Green, George A. Madill and L. M. Rumsey. The same gentlemen are also Directors in the Sedalia Electric and Power Company and the Moberly (Mo.) Gas and Electric Company.

THE Philadelphia (Pa.) Gas Improvement Company has placed the order for the iron roof over its new coal shed with the Berlin Iron Bridge Company, of East Berlin, Conn.

AT a recent meeting of the Charlestown (Mass.) Council an order was passed requesting the Mayor to correspond with the State Board of Gas and Electric Light Commissioners with a view to securing cheaper gas for the residents of the Charlestown district.

DURING the month of February the following dividends on the shares of the named Gas Companies were disbursed in San Francisco:

	Per Share.	Amount.
Central Gas Company	$1.00	$20,000
Oakland Gas Company	.20	6,000
Pacific Gas Imp. Company	.50	15,000
San Francisco Gas Light Company	.35	35,000
	$2.05	$76,000

The dividend of the Central Company is for the quarter ended March 1, and the others are for the month of February. It might also be noted that the California Electric Light Company, of San Francisco, declared a dividend of 15 cents per share for the month of February, which amounted to $7,500. The Edison Light and Power Company, also of San Francisco, paid its shareholders 8 cents per share for February, the return amounting to $10,666.

ON the last day of February a bill filed in the Chancery Court of Warren County, Miss., by the Trustees of the street railway and illuminating properties, assignees of the General Electric Company, against the Hill City Electric Light Company, of Vicksburg, the foreclosure of mortgages to the amount of $29,000 is sought. The Chancellor appointed Mr. Thomas M. Smedes receiver, and directed him to carry out all existing contracts of the Company, to make all necessary repairs, and to carry on the business until the foreclosure is completed.

THE Edison Illuminating Company, of Palestine, Texas, has been placed in the hands of a receiver.

THE following joint resolution was recently adopted by the General Council of Lexington, Ky.:

Section 1. That, in order to ascertain the candle power of the light being furnished the city by the Gas Company and the Central Electric Company, the Chairman of the Gas Committee from each Board be authorized to employ experts to make an examination for the purpose of ascertaining if the above-named Companies are furnishing the candle power light called for by the contract, and to report the result of their investigation to the General Council.

Sec. 2. Be it resolved that the expense incurred under this resolution shall not exceed $75.

THE Council of Newport, R. I., has passed a resolution instructing the Street Commissioner and the Chief of the Fire Department to prepare and report an ordinance or ordinances for laying electric wires and regulating the laying of gas and water mains and the connections thereto in the public streets.

"OBSERVER" forwards the following: "At a hearing given by Council upon the petition of the Chelsea (Mass.) Illuminating and Fuel Gas Company for permission to operate a plant in that city, Councilman George Babson, President of the Chelsea, etc., Company, represented the petitioners, and the Hon. D. F. Kimball appeared for the Chelsea Gas Company, as remonstrants. Mr. Babson said: 'We propose to furnish a good gas for lighting and also for heating purposes for $1 per 1,000 cubic feet. We don't intend to ask $1.70 for an inferior article, but will give a better gas than that produced by the Chelsea Gas Company. All we ask now is that the Council examine the plant, and if you will set a date, why, we will take you down in hacks and bring you back.' Mr. Babson then gave a glowing picture of the process of manufacture his Company proposed to employ, and wound up by remarking that although he knew some of the Aldermen were prejudiced in the matter, he hoped they would give it careful consideration before casting their votes. Ald. Chipman claimed that he was unprejudiced, but desired to ask a question or two, and then launched the following query: 'What is the candle power of the gas?' President Babson admitted that he did not know, and then blurted out, 'It is better than that supplied by the Chelsea Company, anyhow.' Ald. Hadaway inquired if there was a plant of the proposed Babson type in operation anywhere in the State, to which Mr. Babson replied, 'No; but there is one at Hanover, N. H., which lights the college buildings there in a perfectly satisfactory manner.' Ald. Baker inquired if the Company was incorporated, and was told that it was not, whereupon Mr. Kimball made the point that the Board had no legal right to grant the privileges asked for to an unincorporated Company. Mr. C. W. Hinman, for more than twenty years State Inspector of Gas and Gas Meters, who was called by Mr. Kimball, testified that the gas which the opposition Company proposed to supply was not safe, nor was it likely to be of good illuminating power. Mr. Kimball, in summing up, gave an account of how the projectors of a former opposition Company in Chelsea—the American Fuel Gas Company—had deceived and defrauded people who bought stock in that concern, and urged that the present scheme was on a par with the other which had failed. Mr. Babson said he did not want the Aldermen to take his word or that of Mr. Kimball about the proposed Company, but asked them to investigate fully for themselves. On the conclusion of Mr. Babson's statement the hearing was declared closed."

THE Elkins-Van Boeklen scheme for the erection of a fuel gas plant at Haverstraw, N.Y., which it is intended shall be carried on principally for the supply of gas to the kilns of the local brick manufacturers, has been revived. A Mr. A. A. Forman, of Brooklyn, N.Y., is said to be interested in the enterprise.

THE Water Gas Heater Company, of Baltimore, Md., has been incorporated by Messrs. Samuel Childs, J. H. C. Watts, E. P. Keech, Jr., W. F. Beasley and John T. Mason. It is capitalized in $100,000.

MR. J. F. BARKER, writing to the JOURNAL from Baltimore, Md., under date of March 10, says: "The annual meeting of the Westminster (Md.) Gas Light Company was held a few days ago, and 1,845 shares of stock were represented. The officers chosen were: Directors, John L. Reifsnider, Charles B. Roberts, Edward Lynch, Wm. A. Cunningham, Robert C. Hall, Chas. F. Reifsnider and Chas. V. Wantz. A meeting of the Board was subsequently held at which most important action was taken. It has been held by many that a reduction of price, materially, would result in largely increased consumption, and the Board, after a thorough discussion of the subject, concluded to test the matter by making the rate 33⅓ per cent. lower than heretofore, or from $3 to $2 per 1,000 cubic feet. The stock has not been a bonanza to the holders, for it is doubtful whether it has averaged more than 1 per cent. dividends per annum, counting from the date of the establishment of the works. For years it made no returns on the investment, and 3 per cent. per annum is all that has been realized since it became a paying stock. In the face of this fact the reduction is heroic. To make good this amount at the reduced rate the consumption must be about doubled and the citizens should meet the action of the Company in the generous spirit in which it was taken. It is said by those who have given the matter careful study that there is not a town or city of the country, of equal size with Westminster, that pays as little for lighting its streets. Under such circumstances every possible encouragement should be given the Company by the citizens."

THE plant of the Vallejo (Cal.) Electric Light and Power Company was to have been sold at auction on the 13th inst., to satisfy a judgment of $10,000.

THE report of the Committee of the Whole, of the San Jose (Cal.) City Council, to whom was delegated the duty of fixing a schedule of rates that might be charged by the local Gas and Electric Lighting Companies of the city, is as follows: Gas for illuminating purposes, $3 per 1,000 cubic feet; for cooking, heating and power purposes, $2.50 per 1,000; arc lights, $2 each per week; each incandescent electric lamp, 16 candle power, $1.50 per month.

THE City Council of Ocala, Fla., has granted a franchise to Mr. E. L. Root and associatiates for the operation of a gas works in that city.

THE Special Committee of the Grand Rapids (Mich.) Council, appointed to secure estimates regarding the cost of a municipal arc light plant, equal to the maintenance of 500 lamps of 2,000 candle power each, submitted the following report:

Buildings	$25,000
Boilers and engines	18,000
Dynamos	12,500
Belting and switchboard	2,000
Contingencies	2,500
500 arc lamps	12,500
Mast arms	8,500
125 miles of wire	31,250
3 miles of conduit	2,500
Towers	16,000
Total	$130,750

The itemized cost of maintaining the plant for a year is put at the following:

Coal	$7,530
Oil, waste, etc	750
Carbons	3,750
Depreciation, repairs, insurance, etc	9,000
Interest, at 4 per cent	6,000
Salary of electrician	1,500
" engineer and assistant	2,000
" dynamo tender	1,200
Wages, 2 firemen	1,200
" 10 men—linemen, laborers, etc	7,000
Total	$39,930

This figures out an annual cost per lamp of $79.86, even on the basis of their own figuring. It is worth while, however, to note that no clerical expense whatever is figured in the estimate. There are other omissions too, which will appeal at once to those who look into the figures presented.

IT is reported that the works of the Schenectady (N.Y.) Gas Light Company are to be sold at sheriff's sale.

IT is said that Congress, as a result of the recent investigation into the affairs of the Washington (D.C.) Gas Light Company, will consider a bill to put the gas rate in that city at $1 per 1,000 cubic feet, provided that if consumers other than the Government shall not pay monthly any gas bill, within 10 days after it shall have been presented, the Company may charge and collect from the consumer so failing to pay $1.25 per 1,000 cubic feet for the gas furnished to the consumer during the month.

THE iron work for the extension of the E. W. Bliss & Co. foundry building, Brooklyn, N.Y., will be furnished by the Berlin Iron Bridge Co., of East Berlin, Conn.

The Market for Gas Securities.

The market for Consolidated gas was uneven for the week, the tendency being towards lower prices. To-day (Friday) the opening was made at 128½ bid, with offerings at 129¼. Yesterday on the Exchange 110 shares were sold at 128, and the closing bid was 128. There is nothing new in respect of legislation over gas rates for New York City and Brooklyn, although it is quite in the cards that the shuffle will soon be made. Our belief is that the $1 rate will not rule this year, but it is only surmise. During the week some inquiry was made for Standard preferred, for which 75 is bid, holders asking 80. To our minds this stock is cheap, and we advise its purchase. Equitable is strong at 182 to 184, and Mutual is steady.

Brooklyn stocks are again in the ascending list, Williamsburgh, Fulton Municipal, Nassau and Metropolitan especially so. There is little doubt that the preliminary conference has done much toward creating a sympathetic feeling among the Companies, and it may be taken for granted that Brooklyn gas affairs are now shaping for systematic settlement. Bay State gas is a trifle weaker than at last time of writing, the bid price being 26½. Chicago gas is fairly strong at 66⅛ to 66¼, the regular quarterly dividend of 1½ per cent. having been declared, made payable on April 2. Baltimore Consolidated is strong, at 62½ to 63. Consumers, Jersey City, is still inquired for, at 25 to 30, and Richmond County Gas Co., of Staten Island, has reappeared in the market, the shares being bid for at 50. There are rumors that the foreclosure suit instituted by certain bondholders of the Equity Company, of Brooklyn, will possibly ultimately involve a looking over of the doings of the Equity Construction Company. We note a sale at auction of 500 shares Fulton Municipal, at 140.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

March 19.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	128½	129¼
Central	500,000	50	90	95
" Scrip	220,000	—	—	100
Equitable	4,000,000	100	182	184
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	108	112
Mutual	3,500,000	100	145	148
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	80	95
" Bonds	150,000	—	—	100
Richmond Co., S. I.	348,650	50	50	—
" Bonds	100,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	—	35
Preferred	5,000,000	100	75	80
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	110	—
Citizens	1,200,000	20	55	—
" S. F. Bonds	320,000	1000	—	101
Equity Gas Light Co	2,000,000	100	—	—
Bonds	1,000,000	—	—	—
Fulton Municipal	3,000,000	100	140	143
" Bonds	300,000		103	—
Peoples	1,000,000	10	—	80
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	98	100
Metropolitan	870,000	100	135	140
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	160	—
" Ctfs.	700,000	1000	99	100
Williamsburgh	1,000,000	50	145	—
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Bay State Gas Co.—				
Stock	5,000,000	50	26½	27
Income Bonds	2,000,000	1000	60	—
Boston United Gas Co.—				
1s Series S.F. Trust	7,000,000	1000	78	—
2d " " "	3,000,000	1000	57	58
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	66⅛	66¼
Chicago Gas Light. & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	81⅛	81½
Consumers Gas Light Co., Jersey City	2,000,000	100	25	30
Bonds	600,000	1000	84	87
Cincinnati G. & C. Co.	7,000,000	100	192	—
Consumers Toronto	1,600,000	50	184½	187
Central, S. F., Cal.			—	100
Capital, Sacramento, Cal			—	55
Consolidated, Balt.	11,000,000	100	62¼	63
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	101
Bonds	250,000		—	—
Detroit Gas Co.—				
1st Mortgage	.....	.....	56	—
East River Gas Co., Long Island City	1,000,000	100	—	—
Bonds	500,000	100	89¼	—
Equitable Gas & Fuel Co, Chicago, Bonds	2,000,000	1000	—	101
Hartford, Conn	750,000	25	120	128
Jersey City	750,000	20	190	200
Louisville, Ky	2,570,000	50	125	130
Laclede Gas Light Co. St. Louis, Mo.—				
Common Stock	7,500,000	100	16	17
Preferred "	2,500,000	100	65	70
Bonds	9,034,400	1000	84½	85
Little Falls N. Y.	50,000	100	—	160
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	30	—
" Bonds	240,000	100	103	—
New Haven, Conn		25	200	—
Oakland, Cal			42⅝	43
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	108
2d "	2,500,000	1000	104	105
Peoples, Jersey City		—	160	170
" " Bonds			—	—
Paterson, N. J.		25	99	102
Rochester, N. Y.		50	80	85
Preferred			90	95
Bonds			90	95
Syracuse, N. Y.	500,000	25	—	—
San Francisco Gas Co. San Francisco, Cal.	10,000,000	100	65½	66
Washington, D. C.	2,000,000	20	240	—
Wilmington, Del.	500,000	50	180	182

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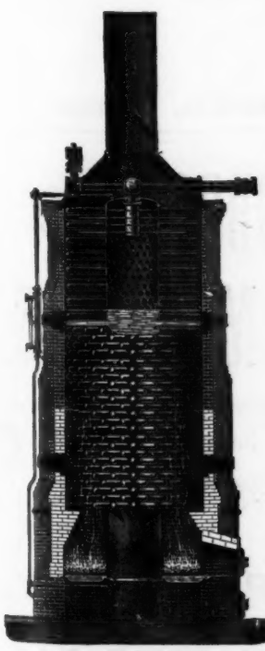

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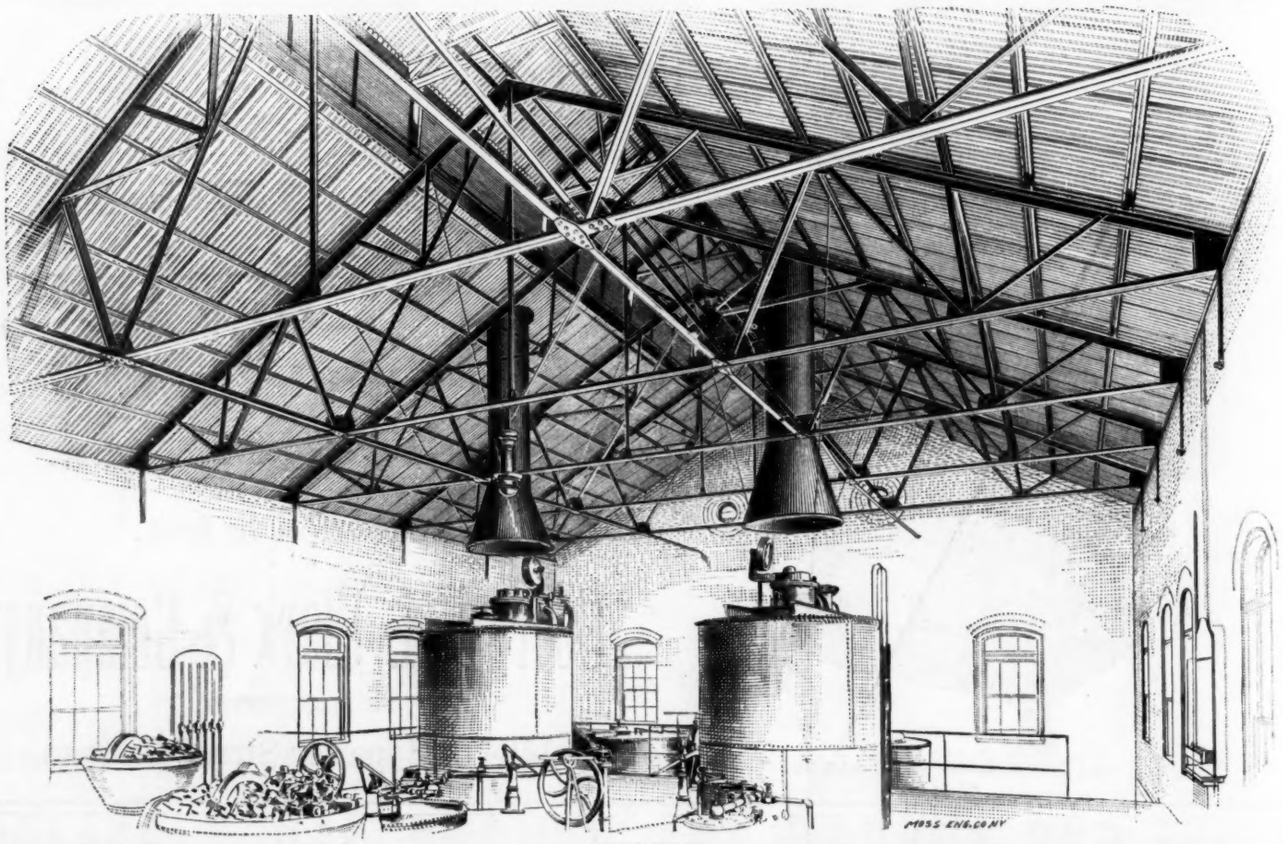

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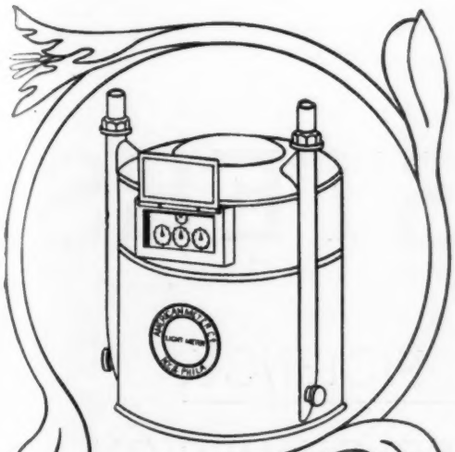

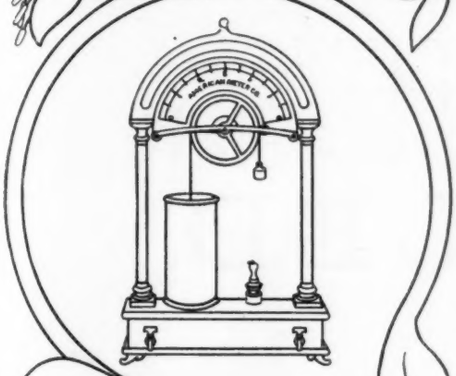

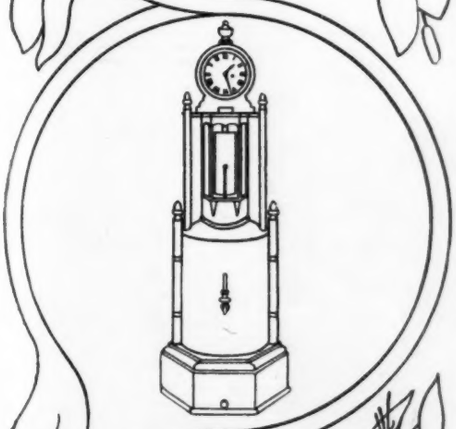

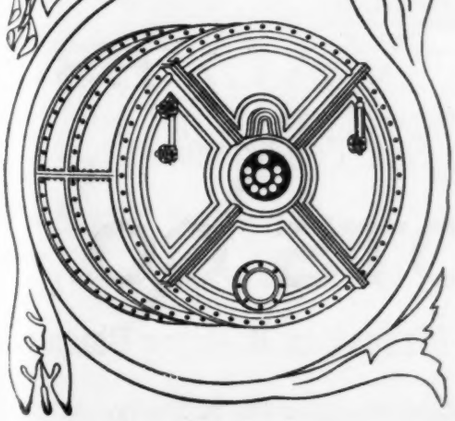

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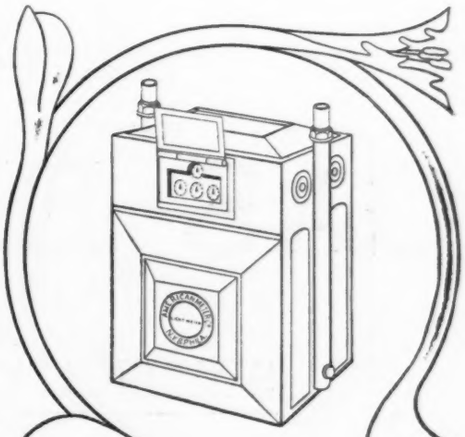
PUBLIC LIGHTING TABLE.

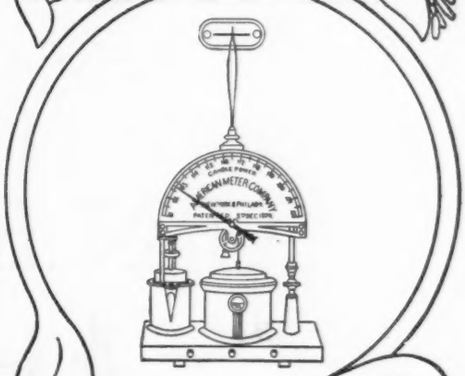
APRIL, 1894.

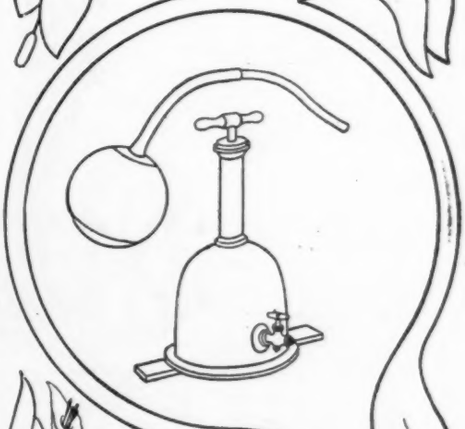
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Sun.	1	6.50 PM	4.40 AM	6.10	4.55
Mon.	2	6.50	4.40	6.15	4.40
Tue.	3	7.00	4.40	6.15	4.40
Wed.	4	7.00	4.40	6.15	4.40
Thu.	5	7.00 NM	4.40	6.15	4.40
Fri.	6	7.00	4.40	6.15	4.40
Sat.	7	7.00	4.30	6.15	4.40
Sun.	8	7.00	4.30	6.15	4.40
Mon.	9	7.00	4.30	6.25	4.30
Tue.	10	11.20	4.30	6.25	4.30
Wed.	11	12.20 AM	4.30	6.25	4.30
Thu.	12	1.10 FQ	4.30	6.25	4.30
Fri.	13	1.50	4.30	6.25	4.30
Sat.	14	2.20	4.20	6.25	4.30
Sun.	15	2.50	4.20	6.25	4.30
Mon.	16	3.10	4.20	6.30	4.20
Tue.	17	3.30	4.20	6.30	4.20
Wed.	18	No L.	No L.	6.30	4.20
Thu.	19	No L. FM	No L.	6.30	4.20
Fri.	20	No L.	No L.	6.30	4.20
Sat.	21	7.10 PM	9.50 PM	6.30	4.20
Sun.	22	7.10	10.50	6.30	4.20
Mon.	23	7.20	11.50	6.40	4.10
Tue.	24	7.20	12.50 AM	6.40	4.10
Wed.	25	7.20	1.30	6.40	4.10
Thu.	26	7.20	2.20	6.40	4.10
Fri.	27	7.20 LQ	2.50	6.40	4.10
Sat.	28	7.20	3.20	6.40	4.10
Sun.	29	7.20	3.40	6.40	4.10
Mon.	30	7.20	4.00	6.45	4.00

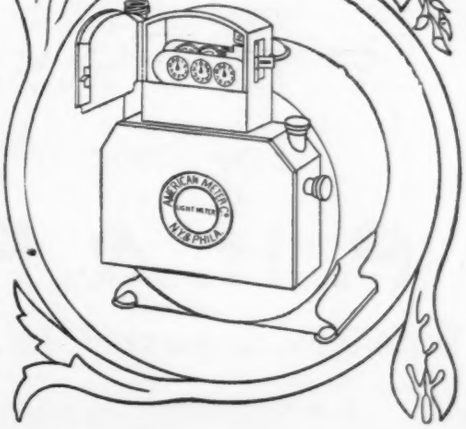
TOTAL HOURS LIGHTING DURING 1894.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	244.10	January	423.20
February	195.30	February	355.25
March	206.20	March	355.35
April	169.40	April	298.50
May	162.10	May	264.50
June	135.40	June	234.25
July	146.30	July	243.45
August	162.20	August	280.25
September	174.10	September	321.15
October	211.20	October	374.30
November	221.00	November	401.40
December	245.30	December	433.45
Total	2274.20	Total	3987.45









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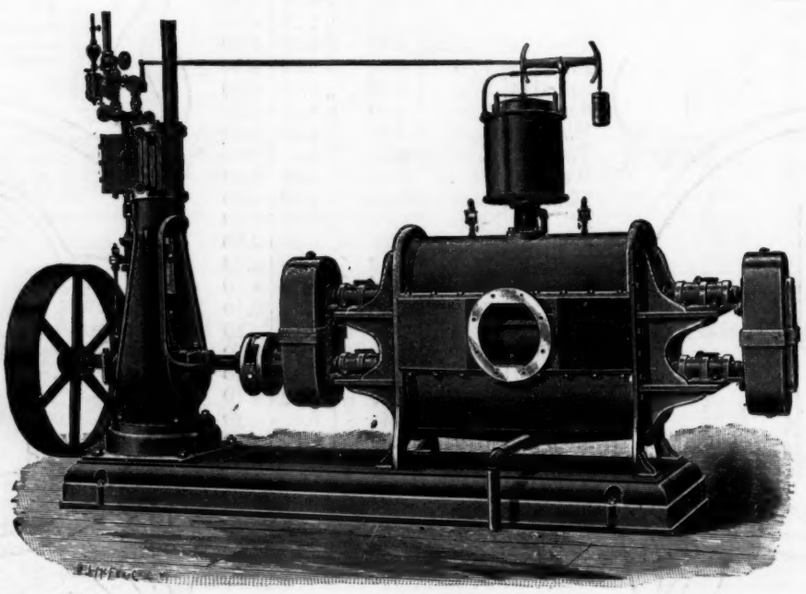

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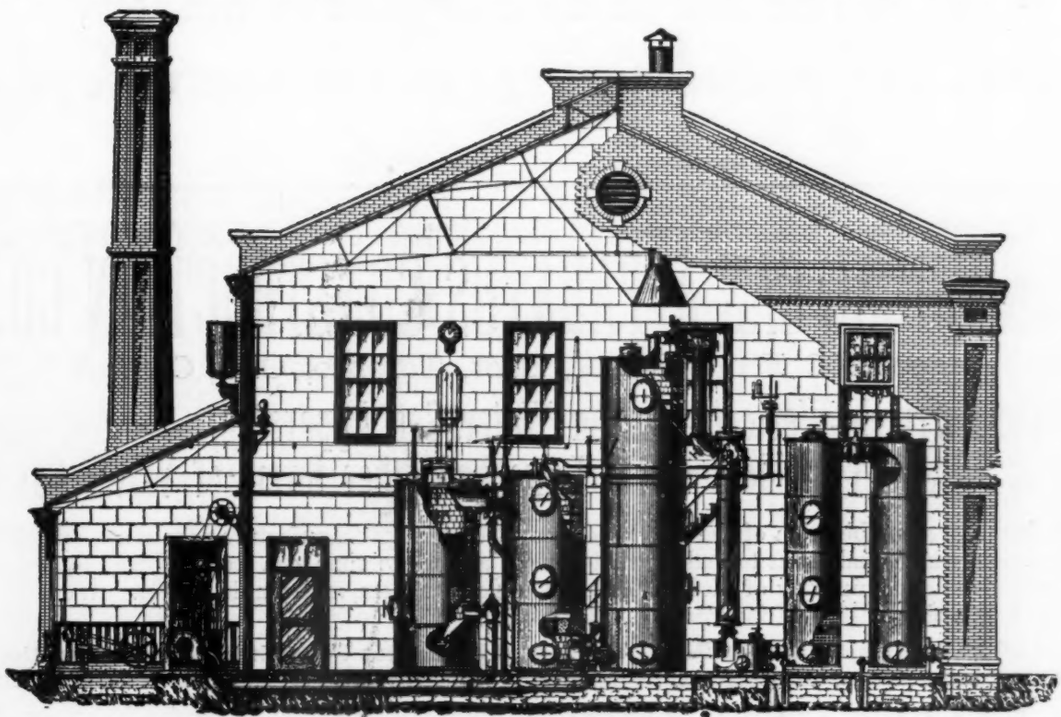

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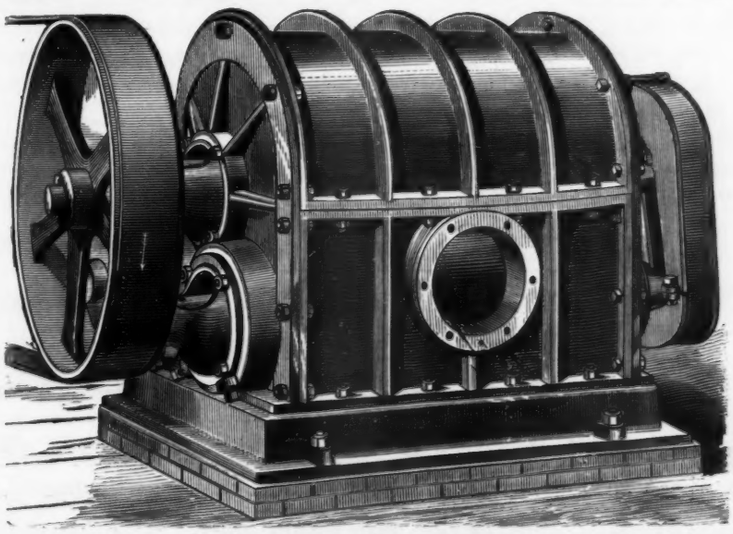

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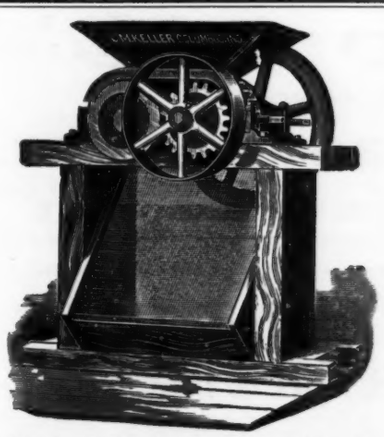

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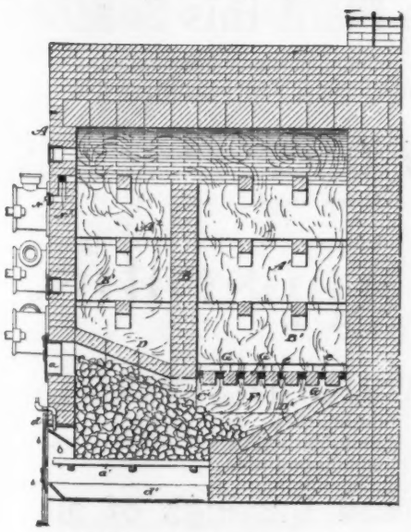

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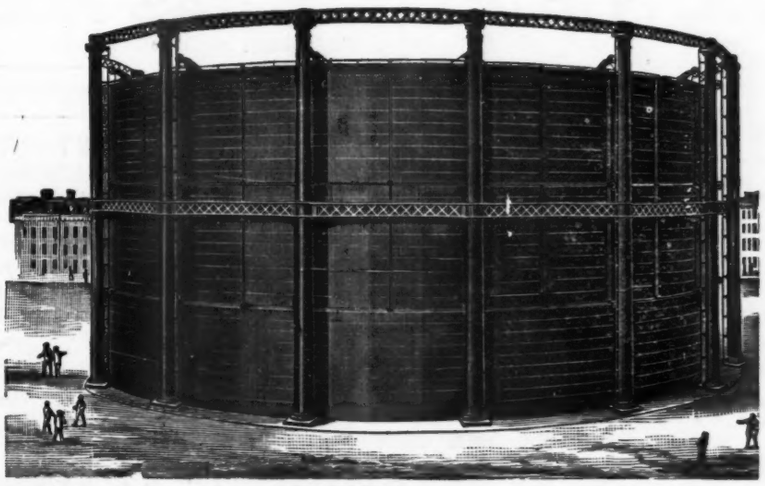

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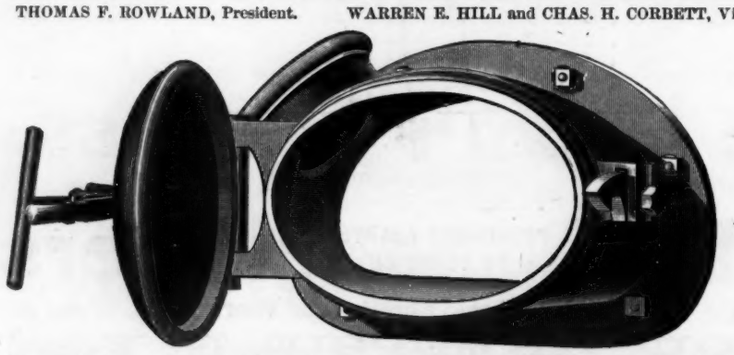

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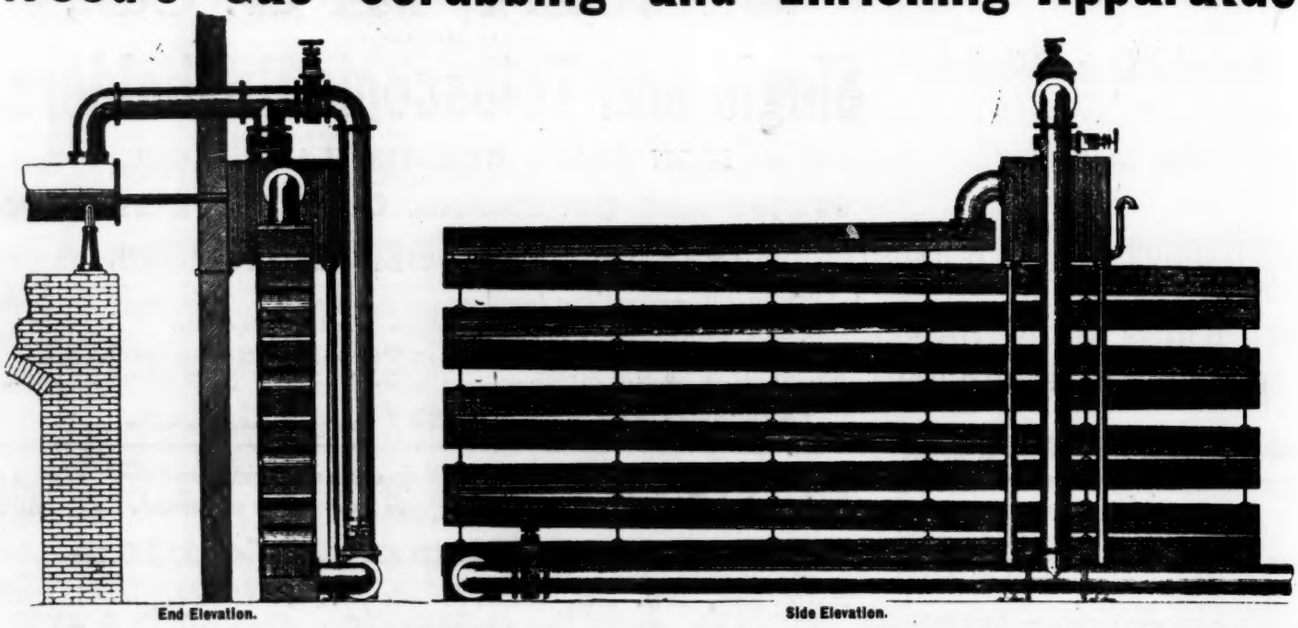

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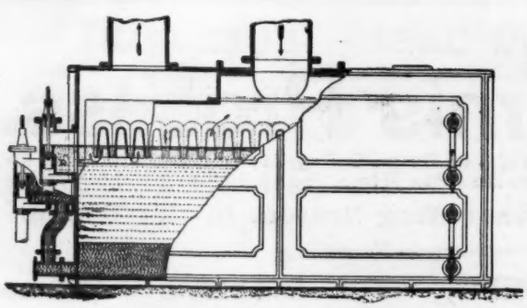

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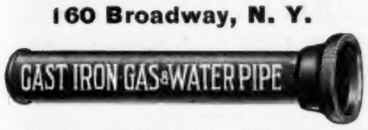

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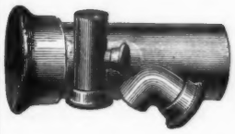

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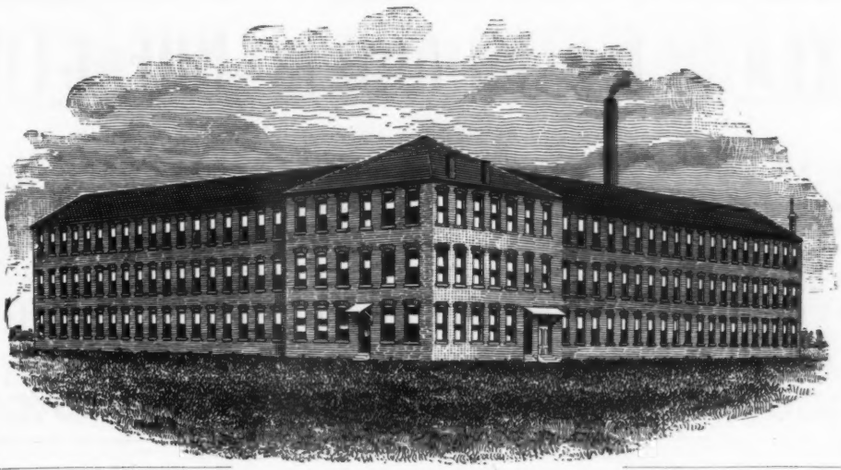

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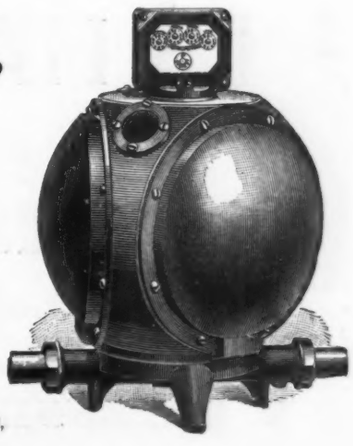

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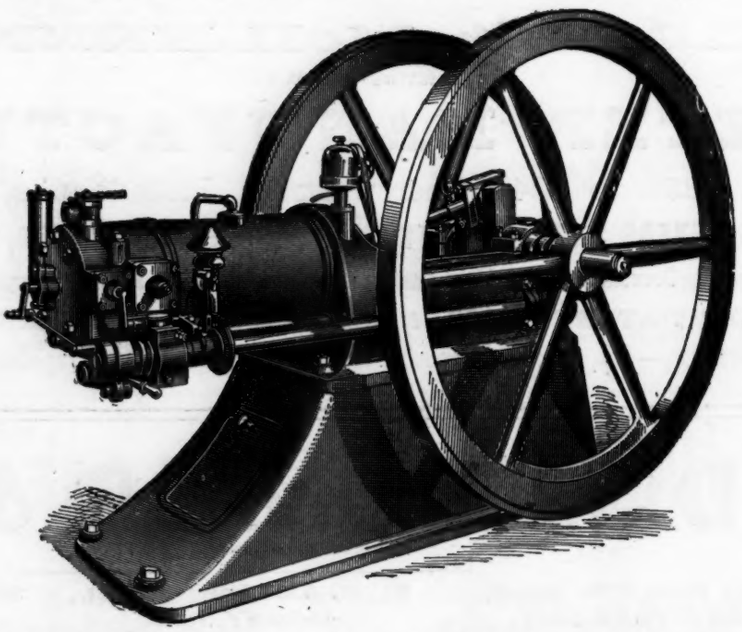

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